GUIDE TO CROP PROTECTION IN ALBERTA

PART I – CHEMICAL

Herbicides
Insecticides
Fungicides

Alberta
AGRICULTURE

84- 4033 /

POISON CONTROL CENTRES

UNIVERSITY OF ALBERTA HOSPITAL
83 Avenue – 112 Street
Edmonton, Alberta
Phone: 432-8822

ROYAL ALEXANDRA HOSPITAL
10240 Kingsway
Edmonton, Alberta
Phone: 474-3431

CALGARY GENERAL HOSPITAL
Calgary, Alberta
Phone: 262-5982
268-9625

FOOTHILLS HOSPITAL
1403 – 29 Street NW
Calgary, Alberta
Phone: 270-1315

The Telephone Number of the Emergency Department of the Hospital in Your Area is (403) ________________

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OR
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GUIDE TO CROP PROTECTION IN ALBERTA

PART I — CHEMICAL

PREPARED BY ALBERTA AGRICULTURE

BEFORE USING ANY PESTICIDE
STOP
READ THE LABEL

THIS PUBLICATION CONTAINS SELECTOR CHARTS AND DESCRIPTIVE TEXT WHICH **MUST** BE USED AS A UNIT.

ALL RECOMMENDATIONS IN THIS PUBLICATION ARE GIVEN IN QUANTITY OF COMMERCIAL PRODUCT PER ACRE(ac) AND [PER HECTARE(ha)].

NOTE: LABEL RECOMMENDATIONS ARE GIVEN IN QUANTITY OF COMMERCIAL PRODUCT PER HECTARE ONLY.

INSTRUCTIONS FOR USE:

1. IDENTIFY THE PEST(S).
2. REFER TO THE APPROPRIATE SELECTOR CHART FOR YOUR CROP.
3. NOTE THE PESTICIDES AVAILABLE FOR CONTROL FROM THE CHART.
4. LOOK UP EACH PESTICIDE AND NOTE CHARACTERISTICS, METHOD OF APPLICATION AND OTHER PESTS CONTROLLED, ETC.
5. SELECT THE MATERIAL BEST SUITED TO YOUR NEED AND APPLY ACCORDING TO DIRECTIONS GIVEN.

NOTE: While every effort has been made to ensure accuracy – Consult the label for final detailed instructions.

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CHEMICAL WEED CONTROL IN ALBERTA

INTRODUCTION

Weeds increased in Alberta during the past decade despite all the technological advances that took place during this decade.

Canada thistle is now the number one perennial weed in the province and wild oats continue to plague many farmers, despite an aggressive and expensive control program during the first half of the 1970s. Stork's-bill, first discovered in Alberta in the early 1970s, is spreading, and scentless chamomile, which was confined to a relatively few districts, is now widespread.

Nodding thistle, which is present in the Calgary area, and Diffuse and Spotted knapweed, which are found in Southern Alberta pastures are the subjects of a major eradication program. Continued vigilance will be required for many years but, at least, infestations are no longer increasing.

This list could go on. Why? Is it because we are directing all our efforts towards controlling weeds and paying insufficient attention to their prevention? In every age, since agriculture was first practised, the means and the tools to control weeds have been available. A number of new tools were added in the 1970s and yet there is little evidence of ground gained. This is not the case everywhere. In some areas in Europe, the main problem is not weeds but volunteer growth from the previous crop. The weeds have been conquered by using all the tools of the trade, both new and old. Are we in North America being carried away by new tools to the point where we are discarding all the old ones – the ones that served agriculture well in the decades gone by?

IDENTIFYING THE PROBLEM

Often weed control is undertaken on an emergency basis. This is never good. Sometimes more expensive or less effective controls must be used than would have been the case if the problem had been anticipated or at least detected early. Check fields early and try to anticipate the possible problems, based on last year's weed situation.

CHEMICAL CONTROL

Many herbicides are available for use on the weeds and crops in Alberta. As well, herbicides are being tested and registered for use in lentils, fababeans and various other special crops. It is a rare weed problem that does not have some form of chemical control available. Herbicides have become very popular because of cost efficiency, and because they are the only control available for use in the growing crop.

Although years of research are completed before any herbicide is registered for use in Canada and then recommended for application in Alberta, there are always a number of failures associated with herbicide use. They fall into two categories:

(a) Crop damage

(b) Inadequate control

The directions for use of herbicides are explicit and are always stated on the label. Most, but not all failures can be explained by the applicator failing to follow the label directions.

MOST COMMON REASONS FOR HERBICIDE FAILURE

1. Improper application

   - Failure to apply the recommended amount. Where rate ranges are given, the minimum is for use on light infestations using good application equipment and techniques. Growing conditions are assumed to be good to excellent and the crop competition normal. Where conditions are less favourable or where the weed population is high the rate should be increased to the maximum allowed.

   - Applications made with poor nozzles, inadequate pressure or inadequate water volumes will result in unsatisfactory control and possible crop damage. Coverage is particularly important with contact herbicides.

   - Failure to incorporate soil-applied materials soon enough or thoroughly enough. Herbicidal activity may be lost by evaporation or by chemical breakdown through exposure to sunlight. Follow the label instructions carefully and ensure the soil is in proper condition to receive the herbicide.

   - Use of poor quality water may result in a loss of activity with some herbicides. Suspended soil particles, or water with a high pH or high mineral content may actually cause a reaction with some herbicides and reduce herbicidal effectiveness.

   - Heavier textured and higher organic soils generally require higher rates of soil-applied herbicides. Check with your supplier or agriculture personnel if this information is not on the label.

2. Improper Timing

   Each weed has a most susceptible stage and each crop a most tolerant stage. The most common problem is treating the crop too late, after the weeds have developed some resistance. The rule of thumb is to treat early within the recommended stage. (Mataven is an exception.)

3. Selection of the wrong material

   It is rare for a farmer to use a herbicide which is totally unsuited to the purpose, but where a mixture of weeds exists and there are several products that could do the job, the choice is often difficult. Study the selector chart closely and try to match the herbicide to your **weed spectrum**. The only certain way to do this is to closely examine your field and do some sample counts.

   It is vital for you to be able to identify weeds in the seedling stage and to identify the leaf stages of both crop and weeds (see following). If you cannot do this, help is available from your district agriculturist, agricultural fieldman, chemical dealer, or technical representatives of herbicide companies.

4. Resistant species or resistant strains

   Not all weeds are the same, you may have a resistant population, either because you have used one herbicide for a long time and the survivors are resistant, or because you happen to have a naturally resistant strain of the weed. To prevent the development of resistance you should rotate your herbicides at the first sign of any problem. If your weeds seem naturally resistant then try a different herbicide.

WHAT TO DO IF RESULTS ARE UNSATISFACTORY

1. Review your procedures, comparing them carefully with the label, to determine if an error was made.
2. Check equipment for worn nozzles, plugged screens, nozzles mixed as to type or size.
3. Recheck calibration, working back from acres or (hectares) covered and herbicide used.
4. If you determine that no error has been made, consider elapsed time since application. Some results are not apparent for several days. Look for early symptoms of the chemical taking effect. "Recognizing Herbicide Action and Injury" is a full color publication available from the University of Alberta bookstore for $4.00, or you may see it at your district agriculturist's office.
5. If there is no apparent activity after a week bring the matter to the attention of your chemical dealer and ask for technical help. At this time gather all relevant information, particularly evidence which may not be obtainable later. Photos or dried specimens may be helpful. Record weather conditions, rainfall, soil condition, crop variety, crop condition, quantity of material used, acres or (hectares) treated, etc.
6. Document your complaint in writing and retain a copy. If crop damage is involved you may wish to submit a specimen for diagnosis. Many disease or insect problems can resemble herbicide injury.
7. If the matter is still unresolved and unexplained, obtain help from your district agriculturist.

CHEMICAL MIXTURES

Many herbicides can be tank mixed to achieve a wider range of weed control or to extend the time range over which they may be applied. A mixture of two or more herbicides may prove beneficial, or some mixtures may simply act as if the components were applied separately. There are a number of mixtures in which the activity of one or both of the chemicals is reduced. Many potential mixtures have not been tested. For this reason and because of the possibility of unknown hazards related to residues in the crops we suggest you use only registered tank mixes. Follow the directions on the label.

Generally speaking, when two herbicides are mixed, each is used at full recommended rate to control an expanded range of weeds. **Always mix only those products recommended on a label and mix only at the recommended rates.**

ADJUVANTS, SURFACTANTS AND WETTING AGENTS

Through hard sell advertising many herbicide additives are recommended to farmers to allegedly enable them to get better performance from the herbicides which they presently use.

ONLY THOSE PRODUCTS NAMED AND RECOMMENDED ON THE LABEL SHOULD BE USED. Failure to follow label instructions could result in very serious consequences.

(a) Crop injury and resultant yield reduction.

(b) Reduced or even no weed control.

(c) Unacceptable chemical residue on the crop and resultant removal from the market-place.

(d) Any deviation from label instructions will invalidate any guarantee from the herbicide manufacturer.

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PESTICIDE SAFETY

1. Pesticide Toxicity

All pesticides have the potential to injure living things, be they plants, animals, or man. However, the extent of the injury depends on how toxic each pesticide is to the organism. This is known as the toxicity of the pesticide. Very often, we would like to know the toxicity of a pesticide to man. However, experiments cannot be done on man, and we have to use animals such as rats, mice, dogs and rabbits and extrapolate the results to man.

From such studies, we know that some pesticides are much more toxic than others to man. This is often reflected in the value of the oral LD_{50} for rats. USUALLY THE LOWER THE LD_{50} THE MORE DANGEROUS IS THE PESTICIDE.

(a) LD_{50}

The LD_{50} of a pesticide is the one single dose of the chemical that will kill 50% of a group of test animals, when the chemical is given by mouth (orally). It is usually measured as the amount, in milligrams of the active ingredient of the chemical per kilogram of body weight of the animal.

Oral LD_{50} Value (mg/kg)	Toxicity	Safety
less than 50	extremely high	extremely low
50 – 300	very high	very low
300 – 600	slightly toxic	slightly low
600 – 1,000	low	high
greater than 1,000	very low	very high

(b) Acute and Chronic Exposure

When a person is exposed to a high level of pesticide within a short while, such as one day, this is referred to as an acute exposure. Chronic exposure on the other hand is where a person is exposed to a low level of pesticide for several days or weeks. Acute refers to short-term; chronic refers to long-term.

2. Human Exposure to Pesticides

Farmers can be exposed to pesticides while handling and mixing powders, dusts and granules; when opening containers of emulsifiable concentrates (E.C.); when pouring concentrated liquids into the sprayer tank; or when spraying pesticides.

Pesticides can enter the human body in three ways: through the skin (dermally), by ingestion or through the mouth (orally), and by inhalation or through the lungs.

(a) Dermal Exposure

Penetration through the skin is the most common way by which pesticides can enter the body, and occurs mainly during handling of the concentrated chemical or during spraying the dilute material without proper safety equipment. Once enough of the chemical enters the body, it can cause immediate illness or even death.

Many pesticides do not penetrate the skin, but can still cause skin problems such as redness, blisters, or dry scaliness leading to serious skin eczema and dermatitis.

Pesticides can easily enter the skin through cuts, scrapes and bruises. These injuries should always be covered with band-aids or bandages before you start to use any pesticide.

Handling of a tractor steering wheel contaminated with pesticides can also allow the chemical to get into the body.

Eye Injury

The eyes particularly are very sensitive to many pesticides. They can be exposed to the vapour or fumes, spray drift or accidental spills and splashes of the chemical when opening containers of liquid concentrates or when pouring the concentrated chemical into the sprayer tank.

(b) Oral Exposure

Pesticides can enter the body when you eat or smoke with contaminated hands or when you lick the chemical off your lips after spraying.

Many cases have been reported of people, especially children being poisoned after drinking pesticides from soft drink bottles. The obvious reason is that someone has transferred the chemical from its original labelled container to a pop bottle without a pesticide label.

The number of accidental poisonings can definitely be reduced if a few simple rules are followed:

- always store a pesticide in its original labelled container
- never eat or smoke after spraying until you have washed thoroughly
- never use your mouth to clear a spray line or nozzle
- store pesticides in a securely locked storage area.

(c) Inhalation Exposure

Pesticides can enter the body when you breathe in vapours, fumes, dust, or spray mist of chemicals. In the case of vapours and extremely fine particles of dust or spray, complete absorption of the chemical by the lungs can occur and the hazard can be great.

3. Human Safety Precautions

Whenever you are going to work with pesticides, you should wear the standard protective clothing which consists of a long sleeve shirt, full length pants, a hard plastic cap, coveralls and long boots. In addition to this minimum, it is up to you to use your good judgement and common sense to determine what extra protection you will need for a particular job. Sometimes the label on the pesticide container will give details as to what extra precautions are required.

Standard Protective Clothing

- long sleeve shirt
- full length pants
- hard plastic cap
- coveralls
- long rubber boots

(a) Skin Protection

Several pieces of protective clothing may be worn when the possibility of skin exposure exists.

Coveralls, gloves, cap and boots are designed to protect users from getting the pesticide on the skin.

(i) Coveralls

When you are spraying the dilute pesticide, coveralls should be worn to protect your ordinary work clothes. Two types of coveralls are available: reusable and disposable. Reusable coveralls are washable and can be used again and again. Disposable coveralls are usually more comfortable in hot weather and are lightweight. However, if they become damaged or severely contaminated, they should be discarded. Wash coveralls after every pesticide application or when otherwise contaminated.

(ii) Gloves

Gloves should be worn when you are handling, mixing or pouring pesticides. Neoprene gloves have been found to be superior to rubber in resisting the penetration of pesticides. NEVER USE LEATHER OR CLOTH GLOVES OR GLOVES THAT HAVE A CLOTH WRISTBAND OR CLOTH LINING. These materials soak up pesticides and become a source of continuous chemical contamination of the body. Never use gloves with holes. Always wear your sleeves outside your gloves to prevent spills and splashes from running into your glove and onto your hand. If pesticide gets into your gloves, wash your gloves and hands with soap and water. Do not delay.

(iii) Caps

Wettable powders, dusts or sprays can be deposited on the hair and the pesticide will eventually get to the scalp and be absorbed into the body. A hard plastic hat should be worn. A CLOTH BASEBALL CAP SHOULD NOT BE USED SINCE IT ABSORBS PESTICIDES.

(iv) Boots

Boots should always be worn while working with pesticides. Neoprene or rubber boots should be used. Do not use leather boots because these will absorb pesticides. Always wear your pant legs *outside* the top of your boots to prevent spills and splashes from running into the boot and onto your leg. If pesticide gets into your boots, wash your boots and feet with soap and water. Do not delay.

(b) Eye Protection

When you are handling dusts, powders or emulsifiable concentrates, you should protect your eyes with *goggles*. Buy goggles that are resistant to chemicals and are non-foggy.

(c) Mouth and Nose Protection

It is easy to breathe in dusts, powders, and sprays while using pesticides. Therefore, you should take measures to prevent inhaling these materials.

NOTE: The gauze and dust masks are not respirators, and are not recommended for pesticide dusts.

(i) Respirator

Respirators cover the nose and mouth. They have one or two cartridges screwed onto the face piece. The cartridges contain a filter pad which removes dust or spray particles, and activated charcoal to bind the chemical. Respirators have a one-way valve that allow the inhaled air to pass through the cartridge and a separate exhalation valve to let the exhaled air out.

Specific types of cartridges protect against specific chemicals. Therefore, be sure you choose one made and approved for use with pesticides.

The following practices should be followed to keep your respirator clean.

- Change respirator cartridges as soon as any odour of the pesticide is detected or after 8 hours of actual use.
- Respirators should be cleaned after each use.
- Remove the cartridges
- Wash the face piece with soap and warm water
- Rinse thoroughly in clean water to remove all traces of soap
- Dry the face piece with a clean cloth
- Replace the cartridges
- Store the respirator in a tightly sealed plastic bag to prevent the cartridges from absorbing chemicals in the air.

(ii) Gas Mask

Gas masks are used when *very high levels* of pesticides are likely to be encountered. This mask covers the eyes, nose and mouth. The face piece of this mask is connected by a flexible hose to a canister worn on the belt.

The use and cleaning practices described above for respirators are to be followed for gas masks as well, with two exceptions:

- Do not change canisters every 8 hours but only when you detect any odour of the pesticide.
- Follow manufacturer's directions for storing gas masks.

(d) Purchase of Safety Clothing and Equipment

Several stores in various cities across Alberta sell safety clothing and equipment. Check the yellow pages under Safety Equipment and Clothing for the stores in your area.

Three stores with offices in both Calgary and Edmonton are:

Fleck Bros. Ltd.
5622 Burleigh Crescent, S.E.
Calgary, Alberta
253-7521

Fleck Bros. Ltd.
7720 – 69 Street
Edmonton, Alberta
456-0741

Safety Supply Canada
7222 Flint Place S.E.
Calgary, Alberta
253-2434

Safety Supply Canada
6120 – 99 Street
Edmonton, Alberta
436-1310

Leavitt Safety Ltd.
3612 Blackfoot Trail S.E.
Calgary, Alberta
243-4273

Leavitt Safety Ltd.
5539 – 99th Street
Edmonton, Alberta
436-3730

4. Symptoms of Pesticide Poisoning

If you take the necessary measures described above to prevent undue exposure to pesticides, barring accidents, you should not absorb enough of the chemical after using it to show symptoms of poisoning. However, if you take inadequate or no precautions, or your safety clothing and equipment are not worn properly or are contaminated, you may show symptoms. The type of symptoms you experience will depend on whether you are using herbicides, fungicides, or insecticides, etc.

Herbicides and fungicides may be described as "plant poisons" whereas insecticides may be referred to as "animal poisons". Because man belongs to the animal class, insecticides have the potential to poison him much more easily than do herbicides and fungicides. A good guide to the ability of a pesticide to poison you is the oral and dermal LD_{50}. The lower the LD_{50}, the greater the poisoning potential of the pesticide.

Some of the most common symptoms of pesticide poisoning are headache and nausea.

5. Pesticide First Aid Kit

It is recommended that you always have a pesticide first aid kit with you whenever you are planning to work with pesticides. This kit is not one you buy in a drugstore, but one that you put together yourself. A well equipped first aid kit, which is always readily accessible can be important in a pesticide emergency.

You should always carry three liters or more of clean water to rinse pesticides off your skin and a clean blanket, kept in a place where it will not become contaminated by pesticides. The blanket is used to keep a poisoned individual warm.

Contents of First Aid Kit

- A small container of syrup of ipecac which is used to induce vomiting. Warm salt water may not be used for this purpose, since death may occur from salt overdose.
- A small plastic bottle of soap solution to quickly wash pesticides off the skin.
- A plastic pint jar of activated charcoal. When charcoal is mixed with water and swallowed, it can absorb many pesticides before they have a chance to poison you.
- Band-aids, bandages, and tape. All cuts and bruises should be covered immediately to prevent pesticides from easily entering the body.
- A shaped plastic airway for mouth-to-mouth resuscitation.
- A list of telephone numbers of Poison Control Centres taped to the inside cover the first aid kit.

6. Poison Control Centres

The emergency department of most hospitals can deal with pesticide poisoning. However, there are four hospitals within the province with additional information on pesticide poisoning.

These four hospitals are:

University of Alberta Hospital
83 Avenue & 112 Street
Edmonton, Alberta
General Information: 432-8822

Royal Alexandra Hospital
10240 Kingsway
Edmonton, Alberta
General Information: 474-3431

Calgary General Hospital
Poison Control Centre: 262-5982
Emergency Department: 268-9625

Foothills Hospitals
1403 – 29 Street N.W.
Calgary, Alberta
Emergency Department: 270-1315

Always carry the address and telephone number of the emergency department of your nearest hospital.

Some manufacturers have emergency telephone numbers to call in case of pesticide poisoning. These are:

Chipman Incorporated
Tel: 1-416-528-0771
1-416-643-4123 from 8:00 a.m. to 4:45 p.m.

Monsanto Canada Inc.
Tel: 1-314-694-1000

Cyanamid Canada Inc.
Tel: 1-416-356-8310

7. Steps to Take in Case of Pesticide Poisoning

When you are going to use a pesticide, you should look for the hazard symbol on the label. This will provide some indication of the toxicity of the pesticide.

If by accident you are severely exposed to a pesticide and you are alone, DON'T PANIC. The symptoms of the pesticide do not show up immediately, so you will have some time to decontaminate yourself. You should get any spilled pesticide off your body as fast as you can.

(i) If the pesticide is on your clothes, remove them and rinse your skin immediately with uncontaminated water. After rinsing your skin, wash with soap and water.

(ii) If you splash or spill a pesticide in your eyes, wash your eyes with water at once. Hold your eyelids open and wash your eyes for at least 15 minutes with fresh water each time. Get help to take you to the emergency of the nearest hospital and take the labelled container with you. Do not use any eye medication unless prescribed by a doctor.

(iii) If you accidentally swallow a pesticide, read the label under FIRST AID INSTRUCTIONS to determine whether or not to induce vomiting. Usually if the formulation contains any PETROLEUM DISTILLATES, vomiting should not be induced. If the label recommends vomiting, induce it at once either by putting your finger down your throat or by drinking 15 mL (2 tablespoons) syrup of ipecac. Get to the nearest hospital as soon as possible. Any delay may cause severe problems later.

Do not induce vomiting if a formulation containing petroleum distillates is swallowed. See a doctor immediately.

(b) When to induce vomiting.

The most important decision you have to make when helping someone who has swallowed a pesticide is whether to induce vomiting or not.

(i) Never induce vomiting if a person is unconscious or is in convulsions. The person could choke to death on the vomit fluid.

(ii) Never induce vomiting if a person has swallowed a corrosive pesticide. The container label will indicate whether the chemical is corrosive by a warning symbol. A corrosive pesticide will cause as severe burns to the throat and mouth coming up as it did going down.

(iii) Never induce vomiting if a person has swallowed a formulation containing petroleum distillates. Most emulsifiable concentrates are of this type.

To induce vomiting after someone has swallowed a pesticide, give two tablespoons of syrup of ipecac, followed by a glass of water. If vomiting does not occur in 15 minutes, the dose may be repeated. Do not waste a lot of time waiting for the person to vomit. Get him to a hospital.

Vomiting may also be induced by giving the poisoned individual 2 glasses of milk or water and then putting your finger down the throat.

(c) Activated Charcoal

After you have given a poisoned individual all the first aid treatment possible, and you cannot get to medical help quickly because of heavy traffic, or because of vehicle breakdown, or for other reasons, activated charcoal may be given to hopefully absorb the remaining pesticide in the person's stomach. When syrup of ipecac has been given, do not use activated charcoal until after vomiting has occurred. The charcoal may inactivate the syrup.

A large amount of charcoal may be required to have any effect. Mix the charcoal with water into a thick soup for the person to drink.

Individuals who work with pesticides should purchase from their pharmacist a sealed one litre jar of activated charcoal and a small bottle of syrup of ipecac to have available in the event of an accident.

8. Bees, Container Disposal, Remote Controls

(i) Bees may be affected by pesticides or honey may be contaminated. Avoid spraying near hives or contaminating puddles of water from which bees may drink. Try to spray early in the morning or late in the afternoon when bee activity is at a minimum. Best of all, warn any beekeepers in the immediate vicinity of your intentions so they can confine the bees or move them until spraying is over.

(ii) Make sure herbicide containers are completely empty when you are finished. We suggest rinsing the container with water three times and adding the wash water to the sprayer tank. The container is then virtually clean and may be disposed of at an approved pesticide container collection site in the various municipalities. Consult your local district agriculturist if a collection site does not exist in your area. Never reuse the container for other purposes.

(iii) Control systems using electrically operated solenoid valves are available. These allow sprayers to be controlled remotely, preferably from within the extra protection of a cab. Trucks or tractors equipped with cabs provide some protection against spray drift and a good tight cab with filtered air intake should reduce but not eliminate human exposure.

SPRAYER OPERATION

This publication presents information regarding application rates and spray volumes in a dual system.

All references are made first in metric measure per ACRE, followed by (metric measure per HECTARE) in brackets, eg. 40 L/ac (100 L/ha).

Herbicide labels and sprayer component manufacturers catalogues will remain entirely in metric.

The conversion factor we have standardized on is 2.471. Therefore when necessary to convert application rates and spray volumes per hectare to rates and volumes per ACRE, divide by 2.471.
eg. herbicide rate per hectare divided by 2.471 = rate per acre
1.5 L/ha divided by 2.471 = 0.607 L/ac

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

spray volume per hectare divided by 2.471 = volume per acre
100 L/ha divided by 2.471 = 40.4 L/ac

The majority of the herbicides that are commonly being used in Alberta are recommended to be applied in 40 litres of spray solution per acre (100 L/ha). We refer to this as the STANDARD spray volume.

For standard spray volumes, recommended nozzle tips are either TeeJet 8002 or Delavan LF 2-80. When pressure is set at 275 kilopascals and speed of travel is 9 kilometres per hour they provide a spray volume of 40 litres per acre (100 L/ha). TeeJet 8002 Low Pressure tips also provide 40 L/ac (100 L/ha) at 9 kmh, but at 100 kilopascals pressure. Note: Some herbicide labels do not recommend using low pressure tips.

BENCHMARKS

Standard Application Volume Is:
100 litres per hectare (L/ha) = 40 litres per acre (L/ac)
1 ha = 2.471 acres

Standard Spraying Pressure Is:
275 kilopascals (kPa) = 40 pounds per sq. inch (psi)
6.9 kPa = 1 psi

Standard Speed For Spraying Is:
9 kilometres per hour (kmh) = 5.6 miles per hour (mph)
1.6 kmh = 1 mph

Standard Nozzle Spacing On A Spray Boom Is:
50 centimetres (cm) = 20 inches (in)
2.54 cm = 1 in

Standard Height Above Target for 80 Degree Nozzle Tips Is:
45 centimeters (cm) = 18 inches (in)

Standard Nozzle Tips Are:
TeeJet 8002 or Delavan LF 2-80
Note: Nozzle output must be 0.75 litres per minute at 275 kPa.
At 9 kmh the above nozzle tips will then apply 40 litres of spray per acre (100 L/ha).

SPRAYER CALIBRATION

Sprayers can be operated at various combinations of speed, pressure and nozzles to produce a wide range of spray volumes (L/ac). Calibration is picking the spray volume required, mixing the chemical and water to the correct strength and then operating the sprayer at the speed and pressure that will provide the desired result.

The spray volume is specified on the chemical label so one decision is eliminated. The pressure at which the nozzle operates correctly is specified by the manufacturer so another decision is eliminated. The spacing of nozzles along the boom has been standardized at 0.5 metres by the manufacturer, so another decision is eliminated.

All that remains for the operator to do is to select the nozzle tip that provides the desired spray volume at a convenient speed; or to pick the correct speed (if nozzles are already determined) and to mix the chemical accordingly.

This system of calibration requires that the sprayer is in good working order, that the nozzles are not worn out and that the gauge provides a true reading of pressure at the nozzle.

The spray pattern must be uniform along the entire boom. To achieve a uniform pattern there are several conditions that must occur simultaneously. These are:

1. Pressure must be set correctly.
2. Spray patterns from each nozzle must not be streaky.
3. Output from all nozzles must be equal.
4. Distance of nozzle tip from target must be correct.

The following steps are suggested to ensure that the sprayer is in good working order so that correct calibration can be achieved.

1. Remove and clean nozzles, screens and filters.
2. Check that nozzles are all the same size and spray angle.
3. Flush the entire system and install filters, screens and nozzles.
4. Check boom pressure with an accurate gauge and compare to sprayer gauge (they should be identical). If boom gauge reads lower, check for a flow restriction.
5. With pressure set at 275 kPa, clean or replace streaking nozzles then collect spray from each nozzle and compare to manufacturers specifications. Replace nozzles that vary by more than 5% of specifications. (nozzle chart in this section)

Note: If ball check valves are being used an extra 35 kPa pressure is required to account for flow restriction. Diaphragm check valves do not require extra pressure.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Once it has been established that the sprayer is operating correctly the spray volume can be determined from the nozzle chart. The spray volume is controlled by varying forward speed. **Do not change pressure setting.**

Example: If a sprayer is equipped with nozzle tips other than the STANDARD tips and the nozzle chart does not indicate at which speed that nozzle will provide 40 L/ac **(100 L/ha)** it will then be necessary to establish that speed.
eg. (from chart)
Nozzle No. 80015 provides 46 L/ac **(113 L/ha)** at 275 kPa and 6 kmh. To find which speed will provide 40 L/ac **(100 L/ha)** multiply: known L/ac x known speed, then divide by required L/ac
46 L/ac x 6 kmh = 276, then divide by 40 L/ac = 6.9 kmh.

SAMPLE NOZZLE CHART

Nozzle Type		Pressure kPa	Output Per Minute Litres	Litres per Acre Litres per Hectare ( ) 50 cm Spacing			
Teejet	Delavan			6 km/h	8 km/h	9 km/h	10 km/h
8001	LF 1-80	275	0.37	30 **(75)**	23 **(56)**	20 **(50)**	18 **(45)**
80015	LF 1.5-80	275	0.56	46 **(113)**	34 **(85)**	31 **(76)**	28 **(68)**
8002*	LF 2-80	275	0.75	61 **(151)**	46 **(113)**	40 **(100)**	36 **(90)**
8001 L.P.		100	0.37	30 **(74)**	23 **(56)**	20 **(50)**	18 **(45)**
80015 L.P.		100	0.56	45 **(112)**	34 **(84)**	30 **(75)**	27 **(67)**
8002 L.P.*		100	0.74	59 **(149)**	45 **(112)**	40 **(100)**	36 **(89)**

* STANDARD Tips for 40 L/ac **(100 L/ha)**

Following are two examples of how a sprayer can be calibrated: The first example uses acres and the second example uses hectares.

SPRAYER CALIBRATION GUIDE
Litres Per Acre (L/ac)

PROCEDURE

Step 1 – Field size
Step 2 – Spray tank capacity
Step 3 – Spray volume (standard is 40 L/ac)
Step 4 – Select nozzle (from chart)
that applies 40 L/ac

EXAMPLE

50 Acres
1800 Litres
40 Litres per acre
8002 = 40 L/ac
at 275 kPa and 9 kmh

PROCEDURE

Step 5 – Total spray volume (acres x L/ac)

EXAMPLE

50 ac x 40 L/ac = 2000 L

NOTE: SPRAY TANK HOLDS 1800 LITRES. AT 40 L/ac ONE FULL TANK COVERS 45 ACRES. A SECOND TANK WITH 200 L OF TOTAL SOLUTION IS NEEDED TO FINISH THE LAST 5 ACRES.

Step 6 – Amount of chemical to add:
(rate per acre x no. of acres)

e.g. label states 0.6 L/ac
0.6 L/ac x 45 ac =
27 L in full tank
0.6 L/ac x 5 ac =
3 L in second tank

Step 7 – Set pressure @ 275 kPa
Drive at 9 kmh (ground speed chart)

SPRAYER CALIBRATION GUIDE
Litres Per Hectare (L/ha)

PROCEDURE

Step 1 – Field size
Step 2 – Spray tank capacity
Step 3 – Spray volume (standard is 100 L/ha)
Step 4 – Select nozzle (from chart)
that applies 100 L/ha
Step 5 – Total spray volume (hectares x L/ha)

EXAMPLE

50 Hectares
1800 Litres
100 L/ha
8002 = 100 L/ha
at 275 kPa and 9 kmh
50 x 100 = 5000 L

NOTE: SPRAY TANK HOLDS 1800 LITRES. AT 100 L/ha ONE TANKFUL COVERS 18 HA. IT WILL REQUIRE TWO FULL TANKS PLUS A THIRD TANK WITH 1400 LITRES OF SOLUTION TO COMPLETE THE FIELD.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Step 6 – Amount of chemical to add:
(rate/ha x no. ha/tank)

e.g. label rates = 1.5 L/ha
1.5 L/ha x 18 ha =
27 L in each full tank.
Third tank needs:
1.5 L/ha x 14 ha = 21 L

Step 7 – Set pressure at 275 kPa
Drive at 9 kmh

GROUND SPEED CHART

Speed	Time to Travel 0.8 km (0.5 mile)	
kmh	Minutes	Seconds
6.0	8	0
6.5	7	22
7.0	6	52
7.5	6	24
8.[illegible]	6	0
8.5	5	38
9.0	5	20
9.5	5	3
10.0	4	48

Note: Speed check should be done on a soil surface similar to that which will be sprayed.

For nozzles or speeds not included refer to manufacturers data or "Guide To Weed Control In Alberta Part III – Herbicide Application Equipment".

If spray charts are not available for your nozzles the following formula may be used to establish their spray volume at a set pressure and speed.

$$\frac{60{,}000 \text{ x L/minute (one nozzle)}}{\text{km/h x nozzle spacing (cm)}} = \text{L/ha}$$

First:
1. Adjust pressure to recommended setting (label).
2. Measure output of one nozzle (all nozzles must be equal).
3. Establish ground speed you will use.
4. Measure nozzle spacing (usually 50 cm).

Then use the above formula.

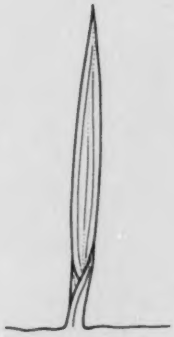
Example: 8002 nozzle @ 275 kPa has an output of 0.75 L/minute and will apply 100 L/ha @ 9 kmh.

$$\frac{60{,}000 \text{ x 75 L/minute}}{\text{9 kmh x 50 cm spacing}} = \frac{45{,}000}{450} = \text{100 L/ha or 40 L/ac}$$

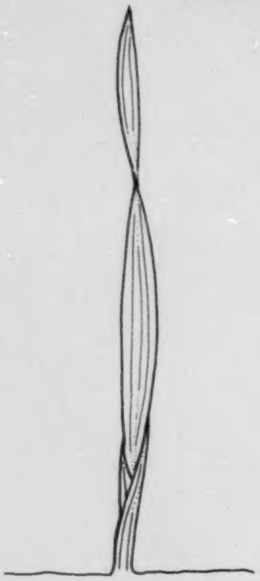
*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

LEAF STAGES – CEREALS and GRASSES

ONE LEAF STAGE

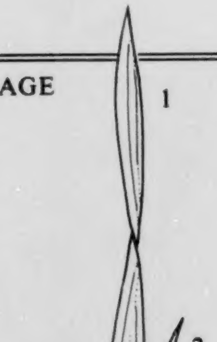


Early

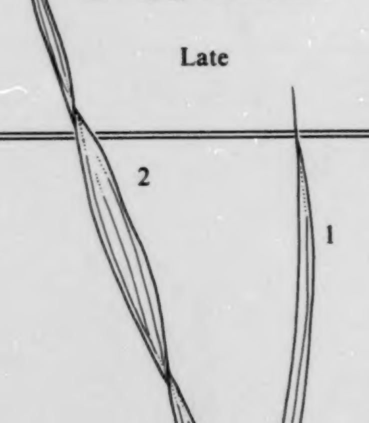


Late

TWO LEAF STAGE



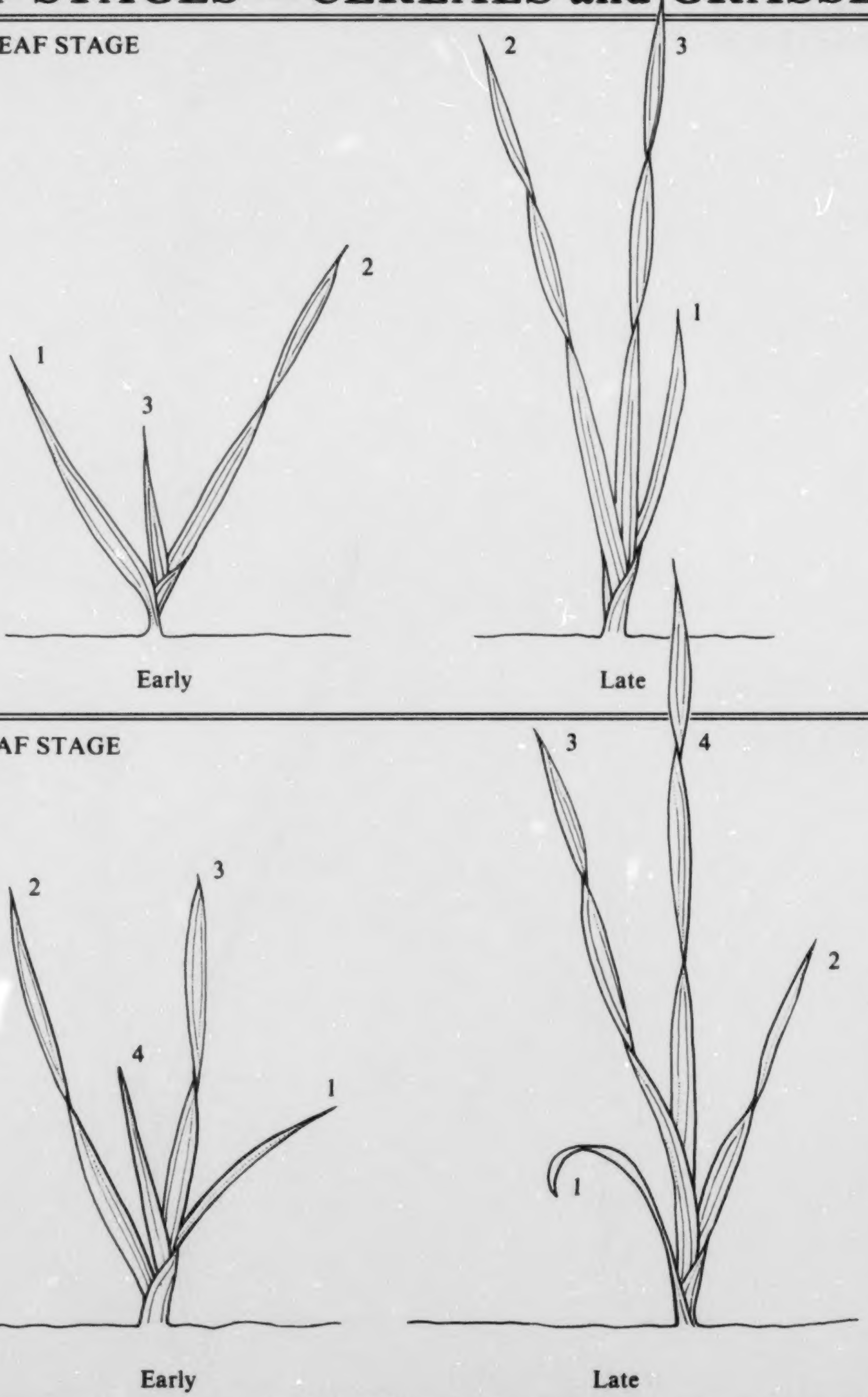
Early



Late

*******LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE******

LEAF STAGES – CEREALS and GRASSES


1
3
2
2
3
1
2
4
3
1
3
4
2
1

THREE LEAF STAGE

Early

Late

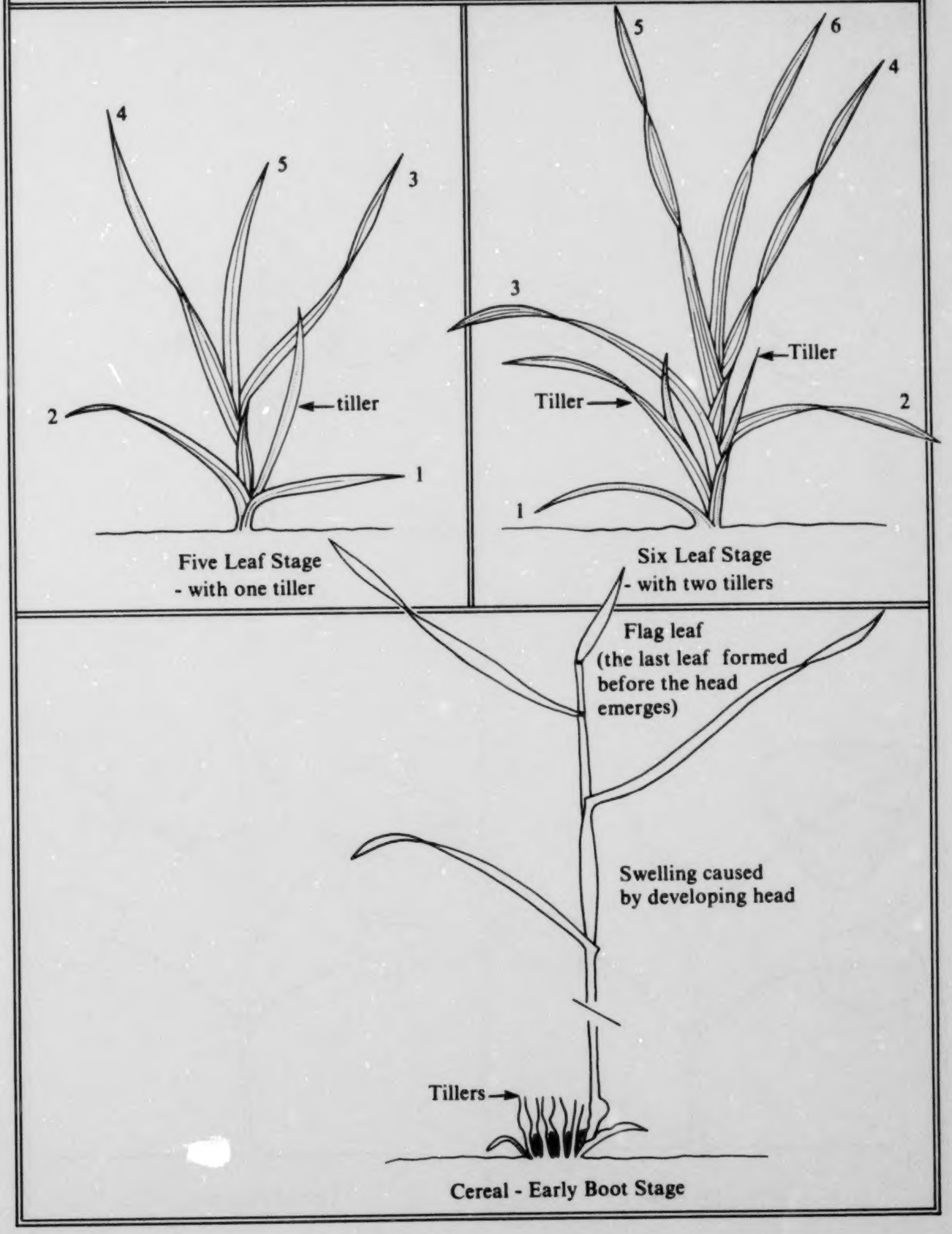
FOUR LEAF STAGE

Early

Late

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

LEAF STAGES - CEREALS and GRASSES


4
5
3
2
tiller
1
5
6
4
3
Tiller
Tiller
2
1
Flag leaf
(the last leaf formed before the head emerges)
Swelling caused by developing head
Tillers

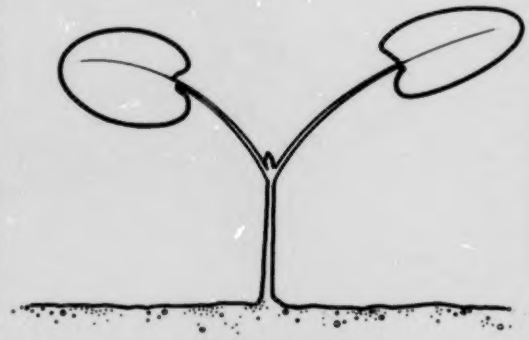
Five Leaf Stage
- with one tiller

Six Leaf Stage
- with two tillers

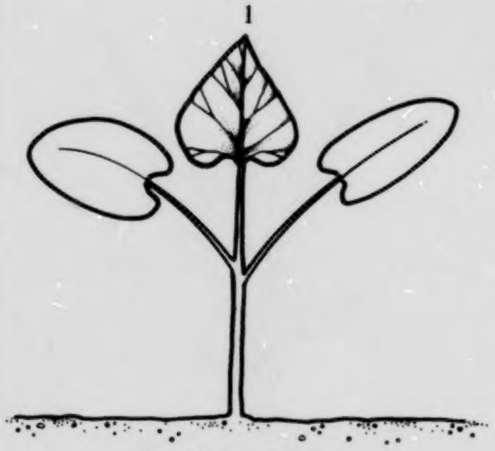
Cereal - Early Boot Stage

LEAF STAGES – BROADLEAVED WEEDS

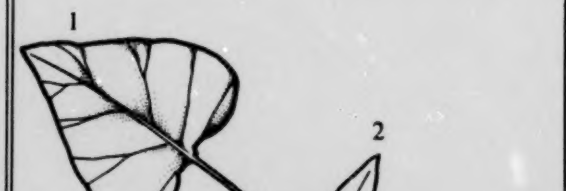
ALTERNATE



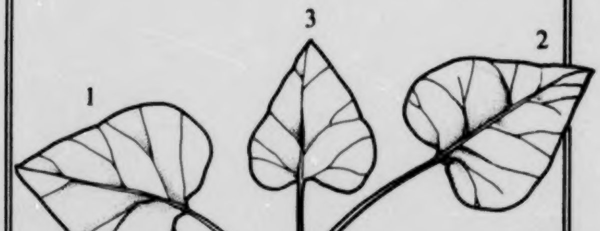
Cotyledon Stage



One Leaf Stage



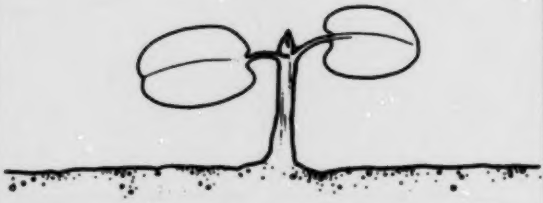
Two Leaf Stage



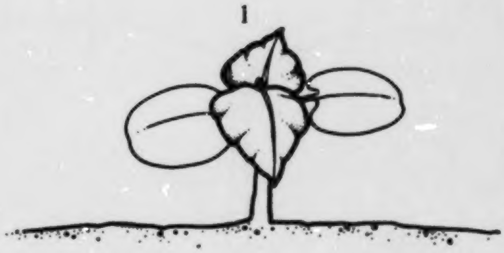
Three Leaf Stage

LEAF STAGES – BROADLEAVED WEEDS

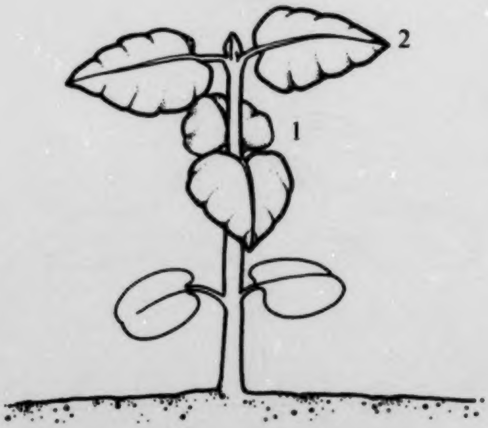
OPPOSTIVE LEAVES



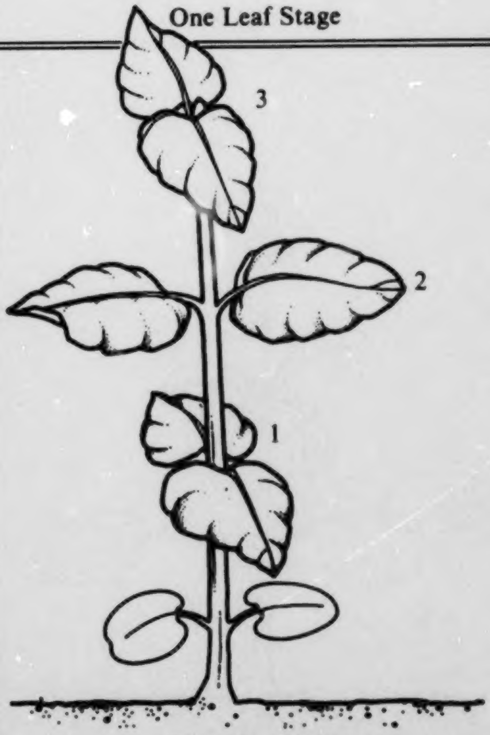
Cotyledon Stage



One Leaf Stage



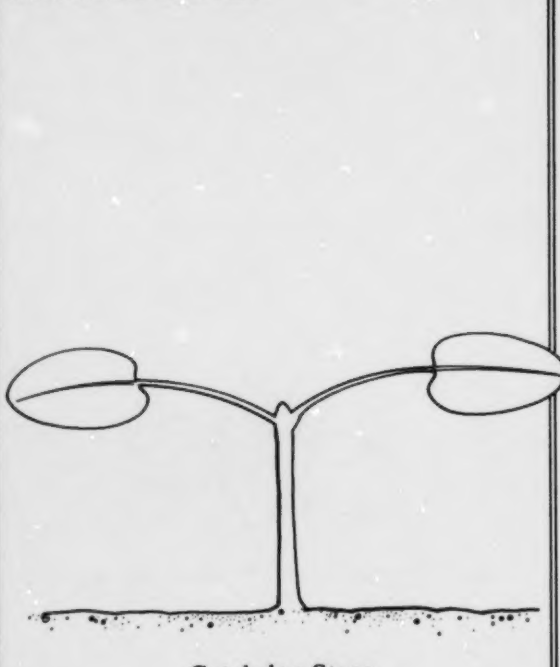
Two Leaf Stage



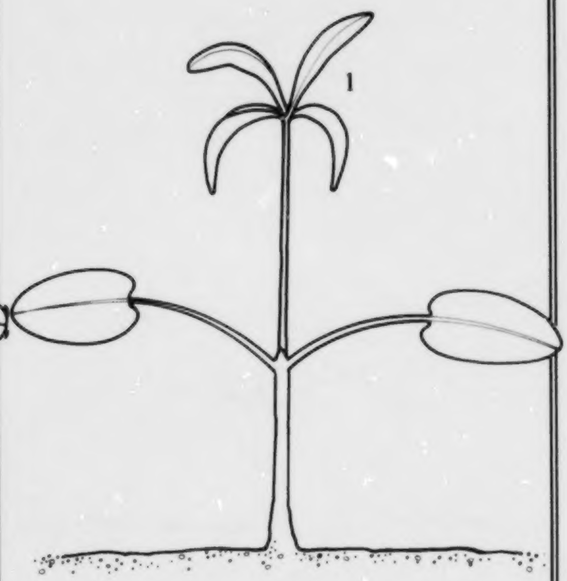
Three Leaf Stage

LEAF STAGES - BROADLEAVED WEEDS

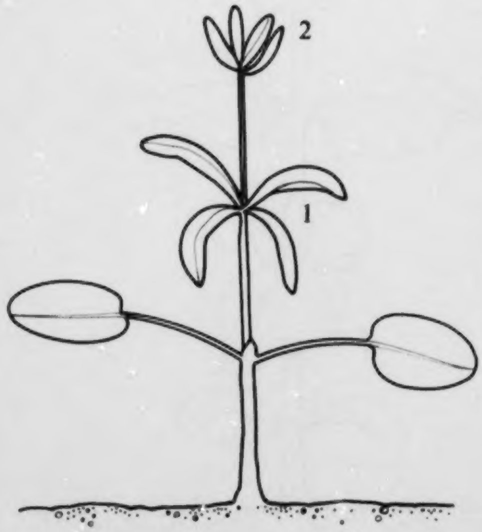
WHORLED LEAVES



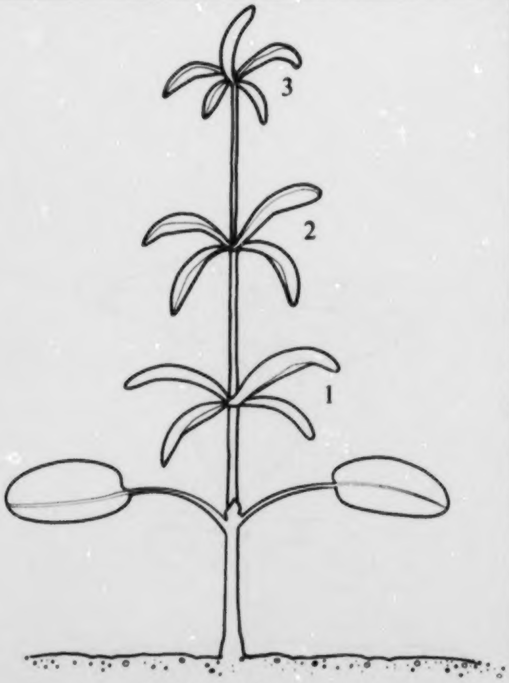
Cotyledon Stage



One Leaf Stage



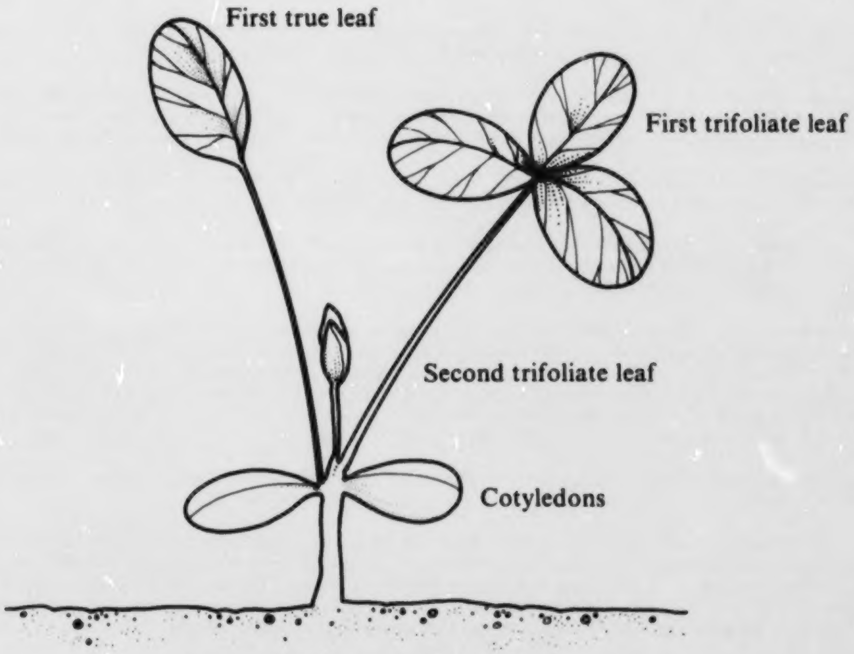
Two Leaf Stage



Three Leaf Stage

LEAF STAGES — LEGUME CROPS

ALFALFA and CLOVERS


First true leaf
First trifoliate leaf
Second trifoliate leaf
Cotyledons

Second Trifoliate Leaf Stage

STOCK POISONING

NITRATES IN FORAGES AND ANIMAL POISONING

Nitrates are the major form in which plants take up nitrogen to be used by the plant for making protein and other nitrogen compounds that are important for plant life and growth. In normal circumstances nitrates are converted to these other products at about the same rate that the nitrates enter the plant. However, under some conditions nitrates accumulate in the plant because they are entering the plant faster than they can be converted into other nitrogen containing compounds. Nitrates can be toxic to livestock. These nitrites combine with livestock blood hemoglobin reducing oxygen utilization and the animal can die from suffocation.

Nitrate accumulation in forages is caused by several factors. An assessment of these factors will be of use in determining the probability of high nitrate levels.

(1) Cereal crops and weeds are likely to contain higher nitrate levels than legumes and grasses. Oats is more of a problem than other cereals.

(2) Heavy application of nitrogen fertilizer, manure and/or sewage can produce high levels of soil nitrate resulting in high nitrate levels in forages under adverse growing conditions. Occasionally summerfallowing can also increase the nitrate levels in the following crops.

(3) In general, plant nitrate levels decrease as the crop matures.

(4) Nitrates accumulate in stems and leaves. They are not present in *seeds*.

(5) A combination of high temperature and low light intensity (sunshine) tends to increase nitrate content in forages. Nitrate levels should be highest after a hot, cloudy day and lowest after a bright sunny day.

(6) Nitrates in freshly cut or grazed forage are converted to nitrites less efficiently by animals than are nitrates in harvested forages. In addition grazed forage is consumed more slowly than silage or hay. Therefore, the overall potential for nitrate poisoning occurring in cattle on pasture is much less than on dry hay containing the same level of nitrate on a dry matter basis.

(7) In properly harvested and packed silage there is little or no loss of nitrates during ensiling. However with poorly ensiled forages a large portion of the nitrates may be degraded to nitrous oxide a poisonous gas.

(8) Leaves are the main structures in the plant for converting nitrates to protein. When leaf damage occurs, such as the result of frost, hail or herbicide damage, the nitrate levels in the plant will increase with time after the damage. The factors will influence the magnitude and duration of the problem.

After severe frost of hail damage the nutrient content of the crop decreases quite rapidly. From a feed value point of view it is important to harvest the feed as soon after the damage has occurred as is practical. With high risk crops it may be advisable to wait for a week or two, depending upon growing conditions, for nitrate levels to decrease. Less than 5% of the forages analyzed at the Agricultural Soil and Feed Testing Laboratory in the past ten years have had high levels of nitrates. When high nitrate levels occur it is usually possible to dilute the overall nitrate content of the feed to acceptable levels by feeding the high nitrate feed in conjunction with a low nitrate feed.

For herbicide damaged forages the same general recommendations apply *unless* there is a withdrawal time that must be observed due to the regulations that apply to the use of that specific herbicide.

If there is a possibility of high nitrates in a feed, have it analysed at a feed testing laboratory before using the feed. If there is a problem a suitable feeding program can be worked out. A veterinarian should be called immediately if livestock are showing unusual symptoms when they are being fed forages containing nitrites. Symptoms of nitrate poisoning include reduced milk production and growth rate, abortions and in severe cases death by suffocation. A properly balanced ration is an important part of reducing the effects of nitrates when feeding forages that are high in nitrates.

GLOSSARY OF TERMS IN WEED CONTROL

Active ingredient (a.i.)	The concentration of a chemical in a formulated product that is responsible for herbicidal effects.
Adjuvant	A substance added to a pesticide formulation to improve the physical properties of that pesticide and hence its effectiveness. e.g. wetting agents, spreaders, stickers, penetrants and emulsifiers.
Antagonism	Opposing action of different chemicals such that the sum of their total effects is less than the effect of each chemical used alone.
Antidote	A first aid treatment to offset the toxic effect of a pesticide.
Bioassay	Determination of a concentration of a herbicide by use of a sensitive indicator plant.
Carrier	A liquid or solid used to facilitate the application of a herbicide to a plant.
Chlorotic	Loss of green colour in foliage.
Contact herbicide	A herbicide that causes localized injury to plant tissue, only where contact occurs.
Crop Canopy	The covering or umbrella of crop plants over the weeds and ground below them.
Degradation	A general term applied to the breakdown of a herbicide by the action of microbes, water, air, sunlight or other agents.
Desiccant	A chemical used to accelerate the drying of plant tissues.
Foliar application	Herbicide applications made to the leaves of plants as opposed to a soil application.
Formulation	The form in which the manufacturer prepares a herbicide to facilitate its use. e.g. granular, emulsifiable concentrate, dry flowable, wettable powder, liquid flowable.
Half-life	The time required to breakdown 50% of the amount of a pesticide.
Incompatibility	A state whereby one pesticide cannot be satisfactorily mixed with another particular pesticide. Resultant mixture may jell, lose activity, settle out or be phytotoxic.
Inhibit	Prevent or stop the process of. e.g. inhibits photosynthesis.
Necrosis	Localized death of plant tissue usually characterized by browning and desiccation.
Photosynthesis	Process by which green plants use sunlight together with carbon dioxide and water to make plant food.
Phytotoxic	Injurious to a plant.
Residual herbicide	A herbicide that persists in the soil and kills regrowth and/or germinating seedlings over an extended period of time.
Soil sterilant	A soil-applied herbicide that is intended to kill all plant life for an extended period of time.
Spray drift	Movement of airborne spray droplets beyond the target area.
Synergism	Complementary action of different chemicals such that the total effect is greater than the sum of their independent effects.
Systemic herbicide	A herbicide that is able to move within the plant from the initial point of contact.
Translocation	The process by which substances move within the plant.

AATREX (atrazine)

1. FORMULATIONS: Atrazine is available from Ciba-Geigy as various formulations:
   Aatrex 80W (80% wettable powder, 2.5 kg bags)
   Aatrex 90W (90% wettable powder, 2 kg bags)
   Aatrex Nine-O (90% water dispersable granule, 4.5 kg bags)
   Aatrex Plus (400 g/L flowable + 25% oil concentrate, 20 L containers)
   Aatrex Liquid (500 g/L liquid, 10 L containers)

2. REGISTERED MIXES: There are no registered mixes with Aatrex Plus.

   The following registered mixes can be recommended
   Aatrex Liquid, Aatrex Nine-O, Aatrex 90W, or Aatrex 80W + Booster Plus (emulsified oil)
   Aatrex Liquid, Aatrex Nine-O, Aatrex 90W, or Aatrex 80W + nitrogen solutions or complete liquid fertilizers
   Aatrex Liquid, Aatrex Nine-O, Aatrex 90W or Aatrex 80W + Dual Ciba-Geigy
   Aatrex Liquid, Aatrex Nine-O, Aatrex 90W or Aatrex 80W + Lasso, Bladex, or Sutan +

3. CROPS: Corn (silage, field and sweet).

4. WEEDS CONTROLLED: A wide range of annual grasses and broad-leaf weeds such as: barnyard grass, buckwheat (wild), clover (volunteer), foxtail (green and yellow)*, lamb's-quarters, mustards, pigweed (redroot), purslane, ragweed, smartweeds (annual), wild oats.

   * Foxtail is best controlled by a post-emergent treatment or pre-plant incorporated, tank mixed with Dual Ciba-Geigy.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Pre-plant treatment
   Pre-emergent treatment
   Post-emergent treatment
   Band treatment

   The above methods of application may be employed with Aatrex Nine-O, Aatrex 90W, Aatrex 80W and Aatrex liquid. Aatrex Plus is designed mainly for post-emergent use but may be applied as a pre-emergence spray after the corn has been planted.

7. HOW TO APPLY:

   With: Ground equipment
   Rate: a) Aatrex Liquid 1.3-2.7 L/ac **(3.25-6.75 L/ha)**. When used with emulsified oil, Aatrex Liquid 1.3.-1.8 L + 6.9 L/ac **(3.25-4.5 L + 17 L/ha)** of emulsifiable crop oil in 60-120 L/ac **(150-300 L/ha)** of water.
   b) Aatrex 90W and Aatrex Nine-O apply at the rate of 0.8-1.5 kg/ac **(2.0-3.75 kg/ha)**.
   c) Aatrex Plus: 1.7-3.4 L/ac **(4.25-8.5 L/ha)**.
   d) Aatrex 80W apply at the rate of 0.8-1.7 kg/ac **(2.0-4.25 kg/ha)**.
   Water Volume: 80-120 L/ac **(200-300 L/ha)**.
   Incorporation: If tillage is intended after spraying do not incorporate deeper than 2.5 cm.
   Pressure: 200-300 kPa
   Ground Speed: No restrictions specified.
   Nozzles: Those capable of delivering 80-120 L/ac **(200-300 L/ha)** in a low to medium range pressure and achieving uniformity of spray application.
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a respirator and goggles when opening Aatrex bags.
   – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS

   (a) Do not mix oil concentrates, surfactants or hormone type herbicides with Aatrex/Bladex or Aatrex/Lasso.
   (b) When mixing Aatrex with other herbicides add the Aatrex to the spray tank first then add either Bladex or Lasso directly but slowly to the tank. Agitate thoroughly before applying.
   (c) Always keep Aatrex or mixtures thereof well agitated.
   (d) Avoid excessive agitation especially where Aatrex and oil mixtures are involved. Excessive agitation can cause Aatrex and oil mixtures to form a grease-like mass and settle to the bottom of the tank.
   (e) The by-pass line should discharge at the bottom of the spray tank.
   (f) Use 50 mesh or larger strainers. Use only metal filters.

9. HOW IT WORKS: The triazine herbicides are potent inhibitors of the Hill reaction, i.e., they are photosynthetic inhibitors. triazines also affect uptake of nutrients and changes in the nitrogen metobolism seem to occur.

10. EXPECTED RESULTS: Failure of weeds to emerge or, depending on weather conditions, weeds may die back soon after emergence.

11. EFFECT OF RAINFALL: Average to moderate rainfall can enhance performance. Very heavy rainfall on sandy soils can cause some leaching and thus a decrease in efficiency.

12. MOVEMENT IN SOIL: Very negligible unless excess moisture is associated with a very sandy soil.

13. CROPPING AND GRAZING RESTRICTIONS: Where Aatrex is used corn should be followed by corn. Avoid drift onto susceptible crops or neighbouring soil during application.

14. TOXICITY

- has very low acute mammalian toxicity
  oral LD_{50} rats = 3,080 mg/kg (active ingredient)
  oral LD_{50} mice = 1,750 mg/kg (active ingredient)
- no short term or long term human health problems are associated with Aatrex when used according to label
- **may be irritating to the eyes**
- non-toxic to fish and birds
- not a skin irritant or skin sensitizer to humans

15. PRECAUTIONS AND FIRST AID: Avoid contact with herbicide.

- If on skin, wash off with soap and water
- If in eyes, wash with clean water for 15 minutes. Get medical attention
- If Aatrex Plus is swallowed, **do not induce vomiting** as the formulation contains petroleum distillates. Get medical attention
- If Aatrex 90W, Aatrex 80W, Aatrex Nine-O or Aatrex liquid are swallowed, induce vomiting. Give plenty of milk or water to drink. Get medical attention
- Always take the labelled container to doctor
- Take the information on Aatrex in this booklet with you to doctor.

FOR PHYSICIAN: If atrazine (except Aatrex Plus) is ingested accidentally, there is no specific antidote. Induce emesis or lavage stomach. Give a saline laxative and supportive therapy. If Aatrex Plus is ingested, do not induce vomiting. Aspiration pneumonia may complicate poisoning. Give symptomatic and supportive treatment.

16. STORAGE: The flowable formulations should be kept from freezing
If stored in unheated areas the product should be warmed and agitated thoroughly prior to using.

17. WHERE AVAILABLE: Green Cross Product Dealers. [Atrazine formulations are also available from dealers carrying FBC Chemicals], Pfizer Chemical dealers.

Additional information available from:

Green Cross Products
820 – 26 Street N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

AFOLAN F (linuron)

1. FORMULATIONS: Dispersion formulation containing 450 g/L linuron.
Available in 10 L containers.

2. REGISTERED MIXES: Afolan F + MCPA amine.

Mixing restrictions: Afolan F is a special formulation of linuron.

Carefully follow mixing instructions:
1. Fill the sprayer half full with clear water.
2. Shake the sealed Afolan F container vigorously.
3. Slowly add Afolan F to the sprayer tank while the bypass or jet agitator is operating.
4. Empty the Afolan F container completely letting it drain in a vertical position for 30 seconds.
5. Add enough rinse water so that the container is one-fifth to one-quarter full.
6. Shake container vigorously, then pour into tank and drain for 30 seconds.
7. Repeat this rinse procedure three times to ensure that all the Afolan F has been transferred to the sprayer tank.
8. Finish filling tank after the rinsing procedures.

CAUTION: To avoid settling in sprayer tank, spray Afolan F solution as soon as possible after mixing.

3. CROPS: Use Afolan F + MCPA amine 500 tank mix on wheat, barley and oats. Use Afolan F alone on asparagus, carrots, corn (field and sweet), celery, dill, parsnips and potatoes.
Underseeding: Do not use on crops underseeded to forage crops.

4. WEEDS CONTROLLED

The following weeds can be controlled or suppressed* with Afolan F alone: annual grasses such as barnyard grass, fall panicum, foxtail (green and yellow), crabgrass, old witchgrass, and broadleaved weeds such as annual sow-thistle, common chickweed, corn spurry, goosefoot, groundsel, knotweed, kochia lamb's-quarters, prostrate pigweed, purslane, ragweed, redroot pigweed, shepherd's-purse, smartweed, stinkweed (pennycress), velvetleaf, wild buckwheat, wild radish and wormseed mustard. Linuron will control dandelion, plantain and sow-thistle seedlings only.

Afolan F plus MCPA amine 500 tank mix will control all those weeds listed above plus: hemp-nettle, Russian pigweed, goat's-beard, prickly lettuce, common burdock, wild mustard, ball mustard, hare's-ear mustard, Indian mustard, tumble mustard, common ragweed and giant ragweed.

5. WEEDS SUPPRESSED: Green and yellow foxtail (if sprayed in the 1 to 3 leaf stage), field horsetail and yellow nutsedge. Best activity on nutsedge and foxtails in corn is obtained after emergence. Suppression is not a kill of the weeds. But it can be expressed as a reduction in height and/or a retardation, yellowing, browning of the leaves. Suppressed plants may recover.

6. WHEN USED:

Wheat, barley or oats – apply when the crop is in the 2-4 leaf stage and weeds in the 1-4 leaf stage. Do not apply after crop has tillered.
Asparagus – apply before spear emergence or after last cutting.
Carrots – apply when crop has 2 or more fully developed leaves and before annual grasses are taller than 5 cm and broad-leaves exceed 15 cm.
Celery – apply to transplants as soon as possible after new growth has started.
Parsnips – apply when crop has 2 or more fully developed leaves.
Shelterbelts – apply before or immediately after weeds emerge, but before they are 10-15 cm tall. Wait 10 days after new trees are transplanted before application. After buds have opened, apply as a directed spray.
Potatoes – apply as a broadcast spray just before crop emergence. Treat before emerged grasses are 5 cm tall and before broadleaves are 15 cm in height.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	Wheat, barley and oats: Apply 0.19-0.25 L of Afolan F and 0.45 L MCPA/ac **(0.47-0.62 L of Afolan F and 1.12 L of MCPA/ha)**. Use the lower rates of Afolan F when growing conditions and rainfall are above average. Asparagus: 1.5-2.0 L/ac Afolan F **(3.7-5.0 L/ha Afolan F)**. Carrots and Parsnips: 0.8-2.0 L/ac **(1.9-5.0 L/ha)** Afolan F. Use lower rates on small seedling weeds and the higher rates on larger established weeds. Shelterbelts: 2.0-4.0 L/ac **(5.0-10.0 L/ha)** Afolan F. At 0.19 L/ac **(0.47 L/ha)** rate of Afolan F, one 10 L container will treat 52.6 ac **(21.3 ha)**.
Water Volume:	Wheat, barley, oats – 40 L/ac **(100 L/ha)** Asparagus, carrots, parsnips – 80-120 L/ac **(200-300 L/ha)**. Shelterbelts – 120-200 L/ac **(300-500 L/ha)**
Pressure:	275 kPa. A pump of sufficient capacity to provide adequate volume through the bypass and/or jet agitation system must be used. This will prevent settling out while spraying.
Ground Speed:	9 km/h
Nozzles:	80° flat fan nozzles. Use 50 mesh or larger line strainers or screens.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS

Avoid overlapping and shut off spray booms while starting, turning or stopping.

Initial temporary lightening of the crop colour may be observed. Early application is important to avoid crop injury. Barley may suffer some growth suppression, maturity delay and yield reduction, but if weed infestation is heavy, these problems will be more than offset.

Do not use formulations of MCPA other than amine, or crop injury may result.

Do not treat fields with a second application of linuron during the same crop year.

Do not apply to crops under drought stress, or those recently exposed to frost.

9. HOW IT WORKS: Linuron is a systemic herbicide with some contact herbicide properties. It is absorbed through both the foliage and the root system of the plant. Once in the plant, its mode of action is to strongly inhibit photosynthesis. MCPA is translocated and causes rapid undifferentiated growth which usually results in death of susceptible plants.

10. EXPECTED RESULTS: When linuron is mixed with MCPA amine, there is evidence of urea and phenoxy activity. The initial effect of linuron is leaf-tip necrosis beginning on the older leaves. This is followed by a water soaked wilted appearance, progressive yellowing, stem collapse and eventual browning and plant death. MCPA has the effect of promoting unequal rates of elongation in the stem, petiole and leaf margin causing bending, twisting and leaf cupping.

11. EFFECTS OF RAINFALL: Do not apply if rain is expected within 1 hour.

12. MOVEMENT IN SOIL: Higher rates of Afolan and extreme moisture conditions may cause some leaching.

13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or feed green plants to livestock.

14. TOXICITY

- has very low mammalian toxicity oral LD_{50} rats = 1,500 mg/kg
- no short term or long term human health problems are associated with this product when used according to label
- **may irritate the eyes, skin, nose, and throat**
- very toxic to fish: LC_{50} 96 hours = 16 ppm
- not a skin sensitizer

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin, eyes and clothing and do not inhale spray mist.
    - In case of contact with skin, wash with soap and water.
    - If in eyes, flush with plenty of water for 15 minutes and get medical attention.
    - If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
    - Take labelled container to doctor.

16. STORAGE: Afolan F cannot be stored below freezing. If stored for one year or longer, shake well before using.

17. WHERE AVAILABLE: Alberta Wheat Pool, United Grain Growers, Pioneer Grain, Federated Co-operatives, Cargill Grain, Niagara Chemical Dealers, Pfizer Chemical Dealers.

Additional information available from:

Hoechst Canada Inc.
295 Henderson Drive
Regina, Saskatchewan
S4N 6C2
Phone: (306) 924-1500

Hoechst Canada Inc.
109, 2915 – 21 Street, N.E.
Calgary, Alberta
2E 6Z1
Phone: (403) 230-2294

ALANAP 3

1. FORMULATIONS: Liquid herbicide containing naptalam 240 g/L
   Available in 20 L containers.

2. REGISTERED MIX: Alanap 3 + Betasan.

3. CROPS: Cucumbers, melons, squash and pumpkins.

4. WEEDS CONTROLLED: Chickweed, cocklebur, lamb's-quarters, pigweed, purslane, ragweed, velvetleaf, crabgrass and foxtail.

5. WEEDS SUPPRESSED:

6. WHEN USED:

   Pre-emergence up to 48 hours after planting cucumbers, melons, squash, pumpkin. Do not use on Butternut squash. Do not apply during adverse growing conditions (very wet + cold weather).

   Post-emergence for cucumbers and melons (not on squash and pumpkins) – spray one month after the pre-emergence spray – spray when crop has emerged but before weed emergence.

7. HOW TO APPLY:

With:

Soil Type	*Pre-emergence*		*Post-emergence*	
	L/ac	**(L/ha)**	L/ac	**(L/ha)**
light soil	4.45	**(11)**	4.45	**(11)**
medium soil	6.9	**(17)**	6.9	**(17)**
heavy soil	12.1	**(30)**	8.9	**(22)**

Water Volume: 100-120 L/ac **(250-300 L/ha)**
Incorporation: Not applicable.
Pressure: 275 kPa
Ground Speed: Speed:
Nozzles: All standard nozzles delivering 100-120 L/ac **(250-300 L/ha)**
Protective Equipment: Standard protective clothing used when applying herbicides.

8. SPRAYING TIPS: Do not apply during adverse growing conditions as stunting of crop may result. Field should be smooth before spray application.

9. HOW IT WORKS: Appears to accumulate in meristematic tissue.
   Alanap 3 inhibits growth in the terminal leaves, shoots or root meristems. It interferes with normal cell division and elongation and with protein synthethis. Uptake of this herbicide can occur through seeds, roots and shoots.

10. EXPECTED RESULTS: Alanap 3 causes stunting and malformed weed seedlings.

11. EFFECTS OF RAINFALL: Heavy rains immediately after application will cause leaching with possible crop injury and reduced weed control.

12. MOVEMENT IN SOIL: Alanap 3 leaches rapidly in highly porous or silt loam soils.

13. GRAZING AND CROPPING RESTRICTIONS: Avoid spray drift to areas planted to sensitive crops as beets, tomatoes, spinach and others.

14. TOXICITY:
    Naptalam:
    - has very low acute mammalian toxicity   oral LD_{50} rats = 8,200 mg/kg
    - non-irritating to skin and eyes
    - non-toxic to fish and wildlife

15. PRECAUTIONS AND FIRST AID: Avoid skin and eye exposure and do not inhale spray mist.

    - If on skin, wash with soap and water.
    - If in eyes, wash for 15 minutes with clean water and get medical attention.
    - If swallowed, induce vomiting by giving one tablespoon syrup of ipecac or by touching the back of the throat with your finger.
    - Take labelled container to doctor.

16. STORAGE: Do not store at temperatures below freezing. If accidentally stored at freezing temperatures it should be placed in an area with temperatures ranging from 25°-50°C for some time and agitated well.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE:

Additional information available from:

Niagara Chemical
Division of Reichhold Limited
1274 Plains Road East
Box 5004
Burlington, Ontario
L7R 3Z1
Phone: (416) 634-2355

AMIBEN (chloramben)

1. FORMULATIONS: Water soluble solution, 240 g/L
Available in 22.7 L containers.
Granular, 10% chloramben by weight
Available in 22.7 kg bags.

2. REGISTERED MIXES: Amiben + Treflan – Only the mix is registered for use on sunflowers.

   Mix Restrictions: None
   Mixing with other pesticides: Not recommended

3. CROPS: Soybeans, white potatoes, red kidney beans, white (dry) beans, tomatoes, pumpkins, asparagus, snap beans, squash, peppers, carrots, lima beans, and shelterbelt plantings. Sunflowers with the tank mix.

   Underseeding: Not recommended

4. WEEDS CONTROLLED:

   Amiben: Chickweed, foxtail (green and yellow), lamb's-quarters, pigweed, ragweed, smartweed (annual), crabgrass, barnyard grass.

   Amiben + Treflan: wild mustard, stinkweed plus the above weeds.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Pre-plant incorporated or post-plant pre-emergent.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	3.8-5.6 L/ac **(9.3-14.0 L/ha)** (liquid) or 9.1-18.2 kg/ac **(22.4-44.8 kg/ha)** (granular) for the vegetable and specialty crops. Check the table on the Amiben label for the individual crop rate. 3.75 L/ac **(9.25 L/ha)** Amiben plus 1.1 L/ac **(2.75 L/ha)** Treflan on medium to heavy soils or 0.8 L/ac **(2.0 L/ha)** Treflan on light soils for sunflowers. [One 22.7 L container of Amiben treats 6.05 ac (2.45 ha) at the 3.75 L/ac **(9.25 L/ha)** rate.]
Water Volume:	40 L/ac **(100 L/ha)**
Incorporation:	Not required for vegetable crops. Incorporate the chemicals immediately and thoroughly into the soil in two directions for sunflowers. The first incorporation should be done within 8 hours of application. The second application should be done at right angles of the first incorporation. Set all implements to cut 8.0 to 10.0 cm deep.
Pressure:	275 kPa
Ground Speed:	Operate disc implements at 6-10 km/h, cultivators 10-13 km/h.
Nozzles:	No restriction
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

   (a) Should not be incorporated with a field cultivator when the soil is crusted, lumpy, or too wet for good mixing action.
   (b) Incorporation with implements set to cut less than 8.0 cm deep or more than 10.0 cm deep may result in erratic weed control.
   (c) Rod weeders, harrows or hoe drills will not provide proper incorporation.
   (d) Seed sunflowers within one week of application for best results.
   (e) A light cultivation with a vegetable crop will increase weed control when there is inadequate moisture to move the Amiben down but enough moisture to germinate the weeds.

9. HOW IT WORKS: Amiben requires moisture for activation. Amiben inhibits root development of seedling weeds. It remains active and effective for several weeks.

10. EXPECTED RESULTS:

    Wild Mustard and Stinkweed: Affected seedlings will not emerge from the ground. Control of cruciferous species will last for at least 6-8 weeks following treatment.

    Sunflowers: No tolerance problems exhibited.

    Conditions under which poor results may be expected:
    1. Application and incorporation when soil surface is wet.
    2. Inadequate soil incorporation or the use of improper incorporation equipment, for sunflowers.
    3. Less than the recommended rate.
    4. Insufficient moisture to carry the chemical into the soil where the weeds sprout, for vegetable crops.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

11. EFFECTS OF RAINFALL: In light soils a heavy rainfall may wash Amiben below the root zone of germinating weed seeds.

12. MOVEMENT IN SOIL: Water soluble.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Non-volatile
    Grazing Restrictions: Not applicable
    Crop Use After Hail: Not applicable
    Succeeding Crops: No restrictions

14. TOXICITY:

    - has very low acute mammalian toxicity oral LD_{50} rats = 3,500 mg/kg
    - no short term or long term human health problems are associated with this product when used according to label
    - **may be irritating to the skin**
    - non-toxic to fish and birds
    - no symptoms of poisoning ever experienced

15. PRECAUTIONS AND FIRST AID: Avoid skin and eye exposure and do not inhale spray mist.

    - If on skin, wash with soap and water.
    - If in eyes, wash for 15 minutes with clean water and get medical attention.
    - If swallowed, induce vomiting. Give plenty of water or milk to drink.
    - Take labelled container to doctor.

16. STORAGE: Do not freeze. Store in heated area. If freezing occurs store in a warm room at 10-27°C for several hours and agitate thoroughly before using to ensure all crystals are dissolved.

17. WHERE AVAILABLE: United Grain Growers, Pioneer Grain, Cargill Grain, Pfizer Chemical Dealers.

    Additional information available from:

    Pfizer C. & G. Inc.
    2140 Notre Dame Avenue
    Winnipeg, Manitoba
    R3H OK1
    Phone: (204) 632-5216

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

AMITROL-T (amitrole)

1. FORMULATIONS: Water soluble solution, 200 g/L
   Available in 1 and 10 L containers

2. REGISTERED MIXES: None

   Mix Restrictions: Not applicable
   Mixing with other pesticides: Not recommended

3. CROPS: Corn, soybeans, white beans, post harvest grains, peas, alfalfa and clover, apple orchards and asparagus. Spot treatment only (see item 6).

   Underseeding: Not recommended

4. WEEDS CONTROLLED: Canada thistle, cattails, hoary cress, horsetail, leafy spurge, milkweed, poison-ivy, quackgrass, sow-thistle (perennial), toadflax, white ash, other perennials and most annuals.

5. WEEDS SUPPRESSED: None

6. WHEN USED:

   Weeds: Canada thistle, perennial sow-thistle – spray when most thistles are in the late bud to bloom stage. If possible, till treated area 2-3 weeks following treatment.
   Quackgrass: Apply when 15-20 cm tall, till about 3 weeks following treatment.
   Hoary cress: Spray during advanced rosette and bud stages.
   Leafy spurge: Spray between the advanced flowering and seed stage.
   Toadflax: Treat during advanced rosette prebud stage.
   Others: see label copy.

   Crops : Used in crop as spot treatment only as is non-selective. See label copy for pre-planting or post harvest treatment.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	Rate varies depending on perennial weed problem present, generally 8.9-14.2 L/ac **(22-35 L/ha)** (see label for specific details). [At 8.9 L/ac **(22 L/ha)** rate, one 10 L container will treat 1.1 ac (0.45 ha)]
Water Volume:	In dry areas, apply in a minimum of 80 L/ac **(200 L/ha)** of water.
Incorporation:	Not applicable.
Pressure:	150-275 kPa
Ground Speed:	Adjust ground speed according to desired application rate.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS: Good coverage is essential for complete control.
   Spray to point of plant run-off.

9. HOW IT WORKS: Amitrol-T is a systemic herbicide which works on the chlorophyll of plants. Therefore the weeds turn white and die slowly. Amitrol-T moves throughout the plant including the root system.

10. EXPECTED RESULTS:

    Perennial Weeds: Weeds should start to turn white within 7-14 days of application depending on growing conditions.

    Crops: Not applicable.

    Conditions under which poor results may be expected:
    1. Inadequate spray coverage or rate of application.
    2. When plants are drought-stressed or overmature.
    3. Heavy rains within 12 hours of application.
    4. Tillage too soon after application (wait 2-3 weeks before cultivating treated areas).

11. EFFECTS OF RAINFALL: Heavy rains within 10-12 hours of application may reduce the effectiveness.

12. MOVEMENT IN SOIL: Amitrole persists in the soil for an average of 2-4 weeks when applied at recommended rates.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Most crops, if contacted by spray drift, are sensitive.
    Grazing Restrictions: Do not graze until six months following treatment.
    Crop Use After Hail: Not applicable
    Succeeding Crops: Consult label

*******LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE******

14. TOXICITY:
- has very low acute mammalian toxicity
  oral LD_{50} rats = 24,600 mg/kg
  oral LD_{50} mice = 11,000 mg/kg
- **may be irritating to the skin and eyes**
- **amitrole has potential to cause enlarged thyroid after prolonged exposure**
- however, no short-term or long-term human health problems are associated with this product when used according to label
- non-toxic to fish and birds

15. PRECAUTIONS AND FIRST AID: Full safety measures should be taken to prevent any kind of exposure to amitrole.
- Avoid contact with skin or eyes, and do not breathe in spray mist.
- If on skin, wash with soap and water **immediately.**
- If in eyes, flush with plenty of clean water for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Give plenty of milk or water to drink. Get medical attention immediately.
- Take labelled container to doctor.

16. STORAGE: Store container away from any place where temperature may reach 50°C. Do not store below 4°C. If freezing occurs contents will crystallize. Place in a warm room or in the sun at 20-27°C., with frequent agitation and confirm contents are liquified before using. There is no shelf life limitation.

17. WHERE AVAILABLE: United Farmers Of Alberta, United Grain Growers, Federated Co-operatives, Oliver Agricultural Supply, Alberta Wheat Pool, Pioneer Grain, Cargill Grain, Niagara Chemical Dealers, Pfizer Chemical Dealers, Midland Vegetation Control Inc.

Additional information available from:

Allied Chemical Services Ltd.
5507 – 1 Street S.E.
Calgary, Alberta
T2H 1H9
Phone: (403) 253-8471

AMIZINE (amitrole + simazine)

1. FORMULATIONS: Aqueous solution:
   Amitrole 53 g/L,
   Simazine 106 g/L.
   Available in 20 L containers.

2. REGISTERED MIXES: None recommended

   Mix restrictions: Shake container before using.
   A. Where hose water under pressure is available: Fill tank about one-third with water. Pour in contents of Amizine container. Mix by stirring contents with agitation in the tank.
   B. Where hose water under pressure is not available, or for mixing less than a tankful: Pour 4 L Amizine into a 20 L bucket. Add water to make 20 L. Stir, pour into tank. For preparing less than 20 L of spray, mix Amizine and water in a separate container according to label directions. Pour into tank.

   Mixing with other pesticides: Not recommended.

3. CROPS: Industrial sites and other non-cropped areas.

   Underseeding: Not applicable.

4. WEEDS CONTROLLED: Some of the weeds controlled are: blue grass, Canada thistle, chrysanthemum weed, dandelion, green foxtail, kochia, lamb's-quarters, nightshade, pigweed, quackgrass, ragweed, smartweed, sow-thistle, plantain, purslane, wild oats.

5. WEEDS SUPPRESSED: Not applicable.

6. WHEN USED: Apply Amizine in spring and early summer, before weeds are 8 to 20 cm tall.

7. HOW TO APPLY:

With:	Amizine may be applied with a Meter-Miser, high volume ground sprayer or knapsack sprayer.
Rate:	High volume ground sprayer: Mix 34.4 L/ac **(85 L/ha)** of Amizine. Knapsack sprayer: 0.8 L of Amizine per 100 sq. m.
Water Volume:	High volume ground sprayer: 200 L/ac **(500 L/ha)**. Knapsack sprayer: 8 to 12 L for 100 sq. m.
Incorporation:	Not applicable
Pressure:	275 kPa
Ground Speed:	Adjust ground speed according to desired application rate.
Nozzles:	Use a Tee-Jet 8002 or larger fan type nozzle or its equivalent.
Protective Equipment:	Use standard protective clothing when applying the herbicide. – plus face shield and apron when opening containers of the concentrated product.

8. SPRAYING TIPS: Screens in nozzles as well as those in the suction and lines should be no finer than 50 mesh size.

9. HOW IT WORKS: Liquid Amizine works on the chlorophyll of plants, therefore the weeds turn white and die slowly. Amizine moves throughout the plant, including the root system. The simazine portion of the herbicide will remain in the soil and is absorbed by the roots of germinating weed seeds, thus resulting in short term residual control.

10. EXPECTED RESULTS: Treated weeds start to turn white or brown in 7-14 days and are usually dead in about three weeks. Area treated should remain free of vegetation for one season.

11. EFFECTS OF RAINFALL: Rainfall will carry the chemical into the root zone of the vegetation.

12. MOVEMENT IN SOIL: Amizine will stay near the surface of the soil as it is adsorbed to the soil particles. It resists leaching or downward movement by rainfall. Amitrole persists in soil for an average of 2-4 weeks when applied at recommended rates.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Lilac, privet, honeysuckle and barberry are susceptible to this mixture and may be injured if contacted by spray.
    Grazing Restrictions: Not applicable.

14. TOXICITY:

    - Amizine has two active ingredients, both of which have very low acute mammalian toxicity:
      Amitrole: Oral LD$_{50}$ rats = 24,600 mg/kg
      Simazine: Oral LD$_{50}$ rats = 5,000 mg/kg
    - no short-term or long-term human health problems have been observed for Amizine when used according to label
    - **however, amitrole has potential to cause enlarged thyroid after prolonged exposure**
    - **simazine may cause skin disease (dermatitis)**
    - Amizine is non-toxic to fish and birds

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

15. PRECAUTIONS AND FIRST AID: Full safety measures should be taken to prevent any exposure to Amizine. Avoid contact with skin and eyes, and do not breathe in spray mist.

- If on skin, wash with soap and water immediately.
- If in eyes, flush with water for 15 minutes. Get prompt medical attention.
- If Amizine is swallowed, induce vomiting. Give plenty of water or milk to drink. See a doctor immediately.
- Take the labelled container with you.

FOR PHYSICIAN: Amizine – If ingested accidently, induce emesis or gastric lavage. Give a saline laxative and supportive therapy.

16. STORAGE: Store in dry, heated area. Keep from freezing. If freezing occurs, warm the drum in a warm room or sun, with frequent agitation, until all crystals are dissolved.

17. WHERE AVAILABLE: Allied Chemical Services, Midland Vegetation Control Inc.

Additional information available from:

Allied Chemical Services Ltd.
5507 – 1 Street S.E.
Calgary, Alberta
T2H 1H9
Phone: (403) 253-8471

ASULOX F (asulam)

1. FORMULATIONS: Water soluble solution, containing 400 g active ingredient/L.
Available in 20 L containers.

2. REGISTERED MIXES: Asulox F + Buctril M (Flax)
Asulox F + Embutox E (seedling and established alfalfa grown for seed).

Mix restrictions: Add the required amount of Buctril M and mix, then add Asulox F.

3. CROPS: Flax, seedling and established seed alfalfa.

Underseeding: Flax underseeded with alfalfa only.

4. WEEDS CONTROLLED: Wild oats, volunteer wheat.

5. WEEDS SUPPRESSED: Green foxtail, volunteer oats and barley, barnyard grass, bluebur, wild mustard, stinkweed, wild buckwheat, annual smartweeds.

6. WHEN USED: 2-4 leaf stage of wild oats (majority of plants in 2 to 3 leaf stage) and when flax plants are 2.5-15 cm high or alfalfa plants beyond the first trifoliate leaf stage.

7. HOW TO APPLY:

With: Ground equipment, not floater.
Rate: 1.1 L/ac **(2.75 L/ha)** [one 20 L container will treat 17.9 ac **(7.25 ha)**].
Water Volume: 20-40 L/ac **(50-100 L/ha)**
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: All flat fan nozzles delivering 20-40 L/ac **(50-100 L/ha)**. Floodjet-type tips are not recommended.
Protective Equipment: Use standard protective clothing when applying the herbicide.
– plus face shield and apron when opening containers of concentrated product.

8. SPRAYING TIPS:

(a) Floodjet-type tips are not recommended.
(b) Do not spray non-vigorous crops or when flax is under stress due to drought or excess soil moisture. DO NOT spray in hot, humid weather conditions.
(c) Avoid spraying if rain is expected within 8 hours.
(d) Do not spray when crop is wet or heavy with dew.

9. HOW IT WORKS:

Asulox F is a systemic herbicide which can be taken up by leaves of sensitive plants and translocated to other parts of the plant. It exerts its main effect by inhibiting the process of cell division in the growing points of the plant and greatest visual effects, therefore, occur in new growth. Signs of action are severe yellowing of new leaves, stunting and finally death of the plant. Growing points are killed within one to two weeks but mature leaves present at spraying die slowly.

10. EXPECTED RESULTS:

Wild Oats: Should start to yellow about one week after application. Wild oat plants not at the recommended growth stage or those that emerge after spraying will be unaffected.

Crop: Temporary slight yellowing of the flax leaves may be seen a few days after spraying. Crop recovery from wild oat competition may be slow if the weeds have been allowed to smother the flax. Some check to crop height and possible delay in maturity may be noticed.

Conditions under which poor results may be expected:
1. Rain within 8 hours.
2. Wrong spray volume and ground speed.
3. Wrong timing of wild oat growth.
4. Spraying when foliage is wet with dew.
5. Spraying when flax is under stress or spraying in hot, humid weather.

11. EFFECTS OF RAINFALL: Rainfall within 8 hours may seriously affect activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is low, but cereals can be affected.
Grazing Restrictions: Do not graze or feed crop.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

14. TOXICITY:
    - has very low acute mammalian toxicity
      oral LD_{50} rats = 5,000 mg/kg
    - no short-term or long-term human health problems have been observed for Asulox when used according to label
    - non-toxic to fish, birds and bees

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes and do not breathe in spray mist.

    - If on skin, wash with soap and water.
    - If in eyes, flush with water for 15 minutes. Get medical attention.
    - If Asulox is swallowed, induce vomiting. Give plenty of water or milk to drink. See a doctor.
    - Take the labelled container with you.

16. STORAGE: Store in heated area. Crystals will form if stored below freezing and whole mixture will freeze. Crystals can be redissolved by rolling pail on side in a warm place.

17. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain, Pioneer Grain, Oliver Agricultural Supply, King Agri Serve.

Additional information available from:

May & Baker Canada Inc.
1865 Sargent Avenue
Bay #2
Winnipeg, Manitoba
R3H OE4
Phone: (204) 774-1819

ATRA-MIX (atrazine + oil concentrate)

1. FORMULATIONS: Flowable herbicide containing 400 g/L of technical atrazine.
   Available in 22.7 L containers.

2. REGISTERED MIXES: None

3. CROPS: Corn

4. WEEDS CONTROLLED: Mustards, purslane, ragweed, smartweed, wild buckwheat, lamb's-quarters, redroot pigweed, volunteer clover, barnyard grass, green and yellow foxtail, and wild oats.

5. WEEDS SUPPRESSED: None.

6. WHEN USED: May be applied after emergence of weeds and corn (post-emergent treatment) OR May be applied after planting but prior to the emergence of weeds and corn (pre-emergent treatment).

7. HOW TO APPLY:

With: A properly calibrated boom sprayer designed to apply an overall spray or where between-row cultivation is carried out to alleviate hard soil conditions or control perennial weeds, then a band treatment may be made.

Rate:

Control of Annual Weeds

Soil Type	*Rate per acre*	*Rate per ha*
Light and Sandy	1.7 L	**(4.2 L)**
Loams and Clays	2.3 L	**(5.6 L)**
Muck (high organic) Soils	3.4 L	**(8.4 L)**

Control of Quackgrass

Apply 2.3 L/ac **(5.6 L/ha)** in at least 140 L/ac **(350 L/ha)** of water to quackgrass foliage in fall or early spring. Plough or cultivate one to three weeks later, plant the corn. Apply a second treatment at the same rate as previously described as an early post-emergent spray.

NOTE: Where the above treatment has been used, corn must be grown on the land for at least two successive years.

Water Volume: In the range of 140 L/ac **(350 L/ha)**
Incorporation: Not applicable
Pressure: 200-300 kPa
Ground Speed: To allow delivery of 140 L/ac **(350 L/ha)**.
Nozzles: Capable of delivering 140 L/ac **(350 L/ha)**, screens 50 mesh or larger.
Protective Equipment: Use standard protective clothing when applying the herbicide.
– plus a face shield and apron when opening containers of the concentrated product.

8. SPRAYING TIPS:

(a) Atra-Mix is designed to be applied after the emergence of weeds and corn (post-emergent treatment).
(b) May be applied either as an over-all spray or as a band treatment at proportionately lesser rates of water and herbicide.
(c) Atra-Mix may also be applied after planting but prior to emergence of corn and weeds (pre-emergence).

Special mixing procedures:
(1) Fill the spray tank with water, almost to the top.
(2) Engage the agitation system and add Atra-Mix – top off the tank with water.
(3) Gentle, continuous agitation is required during mixing and spraying. After any break in the spraying operation, agitate thoroughly.
NOTE: Avoid excessive agitation as Atra-Mix may form a grease like mass and settle to the bottom of the spray tank. The by-pass line should discharge at the bottom of the spray tank.
(4) Before refilling, empty the tank as completely as possible to prevent any buildup of oil. If any spray mixture remains in the tank, keep the agitation system in operation to avoid a separation of the oil and water.
(5) If an oil film starts to build up in the tank, drain and clean it with a strong detergent solution or a solvent.
(6) Immediately after use, thoroughly clean the sprayer by flushing entire system with water containing a detergent.

9. HOW IT WORKS: This is a special formulation of atrazine and oil.
   Atrazine is an inhibitor of photosynthesis and also affects the uptake of nutrients and nitrogen metabolism.

10. EXPECTED RESULTS: Failure of weeds to emerge or if there has been little moisture there may be little injury to weeds. When moisture conditions improve, so will the weed kill.

Conditions under which poor results may be expected:
1. No or very slight rainfall.
2. Application of too light a rate for the weeds present and for the soil type.
3. Heavy rainfall on sandy soils may cause leaching, a decrease in efficiency and off target injury.

11. EFFECT OF RAINFALL: Rainfall will activate the chemical, carrying it into the root zone where kill will begin.

12. MOVEMENT IN SOIL: Heavy rainfall on sandy soils may cause leaching and soil movement.

13. CROPPING AND GRAZING RESTRICTIONS: Crop injury may occur if land treated with atrazine is planted to any crop, other than corn, in the year of treatment.

Sugar beets are sensitive to atrazine and should not be planted on land treated with atrazine the previous year.

When an extended period of dry weather occurs during the year of treatment there could be some injury to succeeding crops such as white beans, onions, peas, tomatoes and turnips. Injury is most likely to occur when the seedling crop is subjected to periods of stress such as abnormally hot, dry weather.

Under conditions of heavy rainfall, soil containing atrazine may wash to lower land and injury to present or succeeding crops, other than corn, may result.

To reduce atrazine residues: Thorough tillage, including ploughing should precede the planting of crops other than corn.

Plough the land flat, do not set the furrow on edge.

Uneven application of atrazine or application in excess of recommended rates will not injure corn but may result in injury to other succeeding crops.

14. TOXICITY:

- has very low acute mammalian toxicity
  - oral LD_{50} rats = 3,080 mg/kg (active ingredient)
  - oral LD_{50} mice = 1,750 mg/kg
- **may cause eye irritation**; not a skin sensitizer to humans
- no short-term or long-term human health problems have been associated with this product
- low toxicity to fish and birds

The results of a repeated insult patch test (Shelanski technique) in 50 human subjects showed that Atrazine was neither a primary irritant nor a fatiguing agent and did not produce sensitization in any of these subjects.

15. PRECAUTIONS AND FIRST AID: No symptoms of poisoning should be observed after use. Avoid contact with skin and eyes, and do not inhale spray mist.

- If on skin, wash with soap and water.
- If in eyes flush with water for 15 minutes. Get medical attention.
- If this product is swallowed, **do not induce vomiting since formulation contains petroleum distillates.** Get prompt medical attention.
- Take the labelled container with you.
- Take the information on this herbicide in this handbook to the doctor.

16. STORAGE: No restriction.

17. WHERE AVAILABLE: From major grain companies and many independent farm supply dealers.

Additional information available from:

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421

AVADEX BW (triallate)

1. FORMULATIONS: Emulsifiable Concentrate: 400 g/L (22.7 L pail)
   Granular 10% (22.7 kg bags)

2. REGISTERED MIXES: Avadex BW + Treflan
   Avadex BW + Liquid Fertilizers
   Avadex BW + Granular Fertilizers
   Avadex BW + Treflan + Liquid Fertilizers

   Mix restrictions: Thorough and uniform mixing is required.
   Mixing with other pesticides: Not recommended.

3. CROPS: Spring wheat, durum wheat, barley, flax, rapeseed, peas, mustard, sugar beets.

   Underseeding: Forage legumes such as alfalfa, clovers, and bird's-foot trefoil may be seeded with labelled crops treated with Avadex BW herbicide, provided the legumes are not harvested for green crop, silage or hay in the year of seeding.

4. WEEDS CONTROLLED: Wild oats

5. WEEDS SUPPRESSED: None

6. WHEN USED:

   Spring – Pre-plant incorporated on barley, rapeseed, flax, peas, mustard, sugar beets.
   – Post-plant incorporated on spring and durum wheat.
   Fall – All crops

   NOTE: Since soil drifting may be encouraged by fall incorporation, this application technique is discouraged in those areas where soil drifting is a problem. Good trash management is recommended.

7. HOW TO APPLY:

With: Aircraft (granules only) or ground equipment

Rate:

Spring Applications

Crops	**Liquid**		**Granules**	
	L/ac	**(L/ha)**	**kg/ac**	**(kg/ha)**
Spring or durum wheat	1.4	**(3.5)**	6	**(15)**
Barley	1.7	**(4.25)**	6-7	**(15-17.5)**
Flax, rapeseed, peas, mustard sugar beets	1.7-2.2	**(4.25-5.5)**	7-9.1	**(17.5-22.5)**

Fall Applications

	Liquid		**Granules**	
	L/ac	**(L/ha)**	**kg/ac**	**(kg/ha)**
Spring or durum wheat	1.14-1.7	**(3.5-4.25)**	6-7	**(15-17.5)**
Barley	1.7	**(4.25)**	6-7	**(15-17.5)**
Flax, rapeseed, peas, mustard sugar beets	1.7-2.2	**(4.25-5.5)**	7-9.1	**(17.5-22.5)**

Water Volume: Liquid only – minimum of 40 L/ac **(100 L/ha)** of water.

Incorporation: Time – Incorporate liquid immediately following application
– Incorporate granules within 48 hours following application
Implements – A double disc or light duty cultivator followed by harrows should be used for pre-plant incorporated treatments.
– Heavy duty harrows in good condition must be used for post-plant incorporated treatments. Harrows similar to the following are recommended:
  - Allied model #X6121 four bar spring tooth harrows (150 cm width weighing 68 kg per section).
  - Allied models #40 or #60 parallel bar diamond tooth harrows (#40 weighs 28 kg per section, #60 weighs 44 kg per section and are 100 and 150 cm widths respectively).

Pressure: Liquid only – 200 kPa

Nozzles: All fan type nozzles delivering 40 L/ac **(100 L/ha)**

Protective Equipment: Use standard protective clothing when applying the herbicide.
- plus a respirator and goggles when opening bags.
- plus a face shield and apron when opening containers of the concentrated product.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

8. SPRAYING TIPS:

(a) Incorporation equipment should be operated at 9 km/h.
(b) Double discs and cultivators should be set to a depth of cut up to 7.5 cm in order to distribute the herbicide in the upper 5 cm of soil.
(c) The herbicide must be uniformly incorporated into the top 5 cm of soil.
(d) Incorporation under excessively moist soil which hinders thorough mixing of the soil is not recommended.
(e) Straw, lumps of soil, or other materials which are dragged by harrows will cause uneven incorporation resulting in reduced wild oat control.
(f) On stubble, incorporate with a double disc or cultivator implement followed at right angles by a harrow operation.
(g) On summerfallow or level plowed ground, two harrow operations at right angles may be adequate if the soil is loose and free of trash and lumps.
(h) Incorporation of the Avadex BW/urea combination is recommended as follows:
    Spring – On all labelled crops except wheat. Two operations immediately following application at right angles to each other with a delay of 24 hours between incorporations. A vibra-shank or light duty field cultivator is the preferred incorporation implement.
    Fall – On all labelled crops. Fall applications should be immediately followed by one shallow incorporation with a double disc or cultivator followed in the spring prior to seeding by a shallow cultivation at right angles to the fall operation.
(i) Seeding operations which leave deep ridges, as is the case with many hoe-drills, should be followed by a harrow operation to control wild oats emerging in the drill rows.

9. HOW IT WORKS: Applied prior to germination, Avadex BW is absorbed by wild oat shoots, usually resulting in death before emerging through the soil surface. Occasionally (particularly under dry conditions), some wild oats may emerge and reach the 3 or 4 leaf stage before dying from their intake of Avadex BW.

10. EXPECTED RESULTS:

Wild oats: The major effects of Avadex BW on wild oats are evident before they emerge through the soil surface. Scraping away the top 1.5-2.5 cm of soil 1 to 2 weeks following treatment and/or seeding will expose white to yellow colored wild oats shoots 2.0-2.5 cm in length with pinched tips. These shoots are essentially dead and will decay. Plants which have emerged and absorbed a lethal dose of Avadex BW will display a protrusion of the growing shoots through the lower stem of the wild oat plant. Under dry soil conditions, a timely rainfall of 1.5 cm or more when wild oats are emerging, can cause post-emergent die-back of a high percentage of wild oat plants on most soil types.

Crop: Wheat seeded into the treatment zone under very dry soil conditions may be thinned and delayed when germinating and emerging just prior to a heavy rainfall. Wheat must be seeded at least 1.5 cm below the treated layer of soil (eg. 5 to 7.5 cm). This will serve as substantial protection against the possibility of crop thinning.

Conditions under which less than satisfactory results may be expected:
1. Incomplete incorporation due to wet, cloddy soil, or heavy trash.
2. Incorporation delayed.
3. Very dry soil conditions.
4. Disruption of the Avadex BW treated layer of soil, such as with the seed drilling operation, may leave seed drill ridges in which wild oats can emerge.
5. Equipment deficiences such as too light harrows.

11. EFFECTS OF RAINFALL: Required for activation of Avadex BW by keeping the treatment layer in a moist condition. Rainfall immediately following application and before incorporation may result in reduced wild oat control due to loss of Avadex BW into the atmosphere.

12. MOVEMENT IN SOIL: Negligible

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: No effect on standing crops
Grazing Restrictions: None
Crop Use After Hail: No restrictions
Succeeding Crops: Oats should not be seeded into soil treated with Avadex BW in the previous year.

14. TOXICITY:

- has low acute mammalian toxicity
    oral LD_{50} rats = 1,675 to 2,165 mg/kg
    oral LD_{50} dogs = greater than 20 gm/kg
    Dermal LD_{50} rabbits = 2,225-4,050 mg/kg
- may cause slight eye irritation; not a skin sensitizer
- no short-term or long-term human health problems have been associated with Avadex
- slightly toxic to fish; non-toxic to birds

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist. Wear rubber gloves and goggles when spraying.

  - If on skin, wash with soap and water.
  - If in eyes, flush with water for 15 minutes. Get medical attention.
  - If Avadex is swallowed, **do not induce vomiting** because of petroleum distillates in the formulation. Get medical attention promptly.
  - Take labelled container with you.

  The emulsifiable concentrate (E.C.) of Avadex is combustible. Do not use, pour, spill or store near heat or open flame. In case of fire, use water, spray, foam or CO_2. In case of a spill, flush area with water spray.

16. STORAGE: Store above 0°C to keep from freezing. Freezing will result in crystals which settle to the bottom of the can. If allowed to freeze, place in a warm room (22°C or higher) and roll and shake the can frequently for several days to redissolve.

17. WHERE AVAILABLE: Alberta Wheat Pool; Cargill Ltd., United Grain Growers, Pfizer Chemical Dealers, Federated Co-operatives, Pioneer Grain.

  Additional information available from:

  Monsanto Canada Inc.
  55 Murray Park Rd.
  Winnipeg, Manitoba
  R3J 3E2
  Phone: (204) 885-6740

  In case of an emergency involving a Monsanto herbicide call the following number collect at any time, phone 1-314-694-1000.

AVENGE 200-C (difenzoquat)

1. FORMULATIONS: Water soluble solution 200 g/L
   Available in 20 L containers

2. REGISTERED MIXES: Avenge + Torch or Pardner
   Avenge + Buctril M or Brominal M or Bromox 450M or Sabre
   Avenge + 2,4-D ester (Do not apply to Canary Seed)
   Avenge + MCPA ester + Torch or Pardner
   Avenge + MCPA ester

   Mix restrictions: Add broad-leaved herbicide when tank one half full of water and Avenge when tank 3/4 full; circulate for 5 minutes before spraying.
   Mixing with other pesticides: Not recommended.

3. CROPS: Barley (all varieties), wheat (only on Benito, Canuck, Chester, Columbus, Fielder, Macoun, Neepawa, Selkirk), canary seed, fall rye (Couger, Frontier, Kodiak, Puma, and Rymin), triticale (Carman, Welsh), winter wheat (Norstar, Sundance), underseeded forages in barley or wheat – alfalfa, red clover, sweet clover, bird's-foot trefoil, creeping red fescue, meadow fescue, brome grass, timothy, crested wheat grass, orchard grass, Russian wild rye grass, reed canary grass, Kentucky blue grass.

4. WEEDS CONTROLLED: Wild oats

5. WEEDS SUPPRESSED: None

6. WHEN USED: Apply when the majority of wild oats are in the 3-4 leaf stage to minimize early wild oat competition and provide maximum yield increases.

   When applied at the 4-5 leaf stage very good control will be obtained, but yield increases may be reduced.

   Do not apply to barley, wheat or canary seed after the 6 leaf stage.

7. HOW TO APPLY:

With:	Aircraft or ground equipment	
Rate:	Barley, all varieties, wheat varieties as listed, canary seed, forages as listed, underseeded to barley or wheat.	1.7 L/ac **(4.25 L/ha)** when there are more than 200 wild oats/m^2. 1.4 L/ac **(3.5 L/ha)** when there are fewer than 200 wild oats/m^2.

[One 20 L container treats 14.2 ac at the 1.4 L/ac rate **(5.7 ha at 3.5 L/ha rate)**].
For the registered mixes use the recommended rate of the Avenge 200-C and the label recommended rate of the other herbicide. Use up to 0.45 L/ac **(1.12 L/ha)** of MCPA ester or 2,4-D ester 500 and use 0.23 L/ac **(0.56 L/ha)** of MCPA ester when tank mixing with 0.48-0.6 L/ac **(1.2-1.5 L/ha)** of Torch and 1.4 or 1.74 L/ac **(3.5 or 4.2 L/ha)** of Avenge 200-C.

Water Volume: Aircraft: Minimum 8 L/ac **(20 L/ha)** Ground – 40 L/ac **(100 L/ha)** Spray Coupe – 40 L/ac **(100 L/ha)**
Incorporation: Not applicable
Pressure: 275 kPa
Ground Speed: 8 km/h
Nozzles: All standard and low pressure nozzles delivering approximately 40 L/ac **(100 L/ha)**
Protective Equipment: Use standard protective clothing when applying the herbicide.
- plus a face shield or goggles, rubber gloves and apron when opening containers of the concentrated product.

8. SPRAYING TIPS:

   (a) 80° nozzles more efficient than 65° nozzles.
   (b) Nozzles should be tilted 45° forward to enhance spray penetration.
   (c) Do not spray if rain is expected within 6 hours.
   (d) If foaming is a problem use a silicone-based anti-foam agent.
   (e) No restrictions on later applications of other pesticides.
   (f) Do not spray when crop is heavy with dew.

9. HOW IT WORKS:

   This chemical acts on the growing point located at or just above the soil surface. Placing herbicide at or below the growing point is most efficient. It disrupts cell division and elongation causing growth to stop. Works best at high temperature and humidity.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

10. EXPECTED RESULTS:

Wild Oats: Should start to yellow within 3-5 days after application. Speed will depend on temperature and humidity. Effect will be faster when temperature and humidity are high. Affected plants will turn brown or remain stunted and partially green throughout the season. Wild oats in the 1-2 leaf stage at spraying or those that emerge after spraying will be unaffected.

Crop: With rapid activity a slight yellowing of the crop may be visible in 5-7 days after application. It will not be visible 2 weeks after spraying.

Conditions under which poor results may be expected:
1. Spraying before 3 leaf stage.
2. Too low a rate of Avenge for the wild oat population.
3. Inadequate coverage due to dense broad-leafed weed population.

11. EFFECTS OF RAINFALL: Rainfall within 6 hours will seriously decrease activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is low; only oats can be seriously affected by drift.
Grazing Restrictions: Do not graze or feed crop for 8 weeks after treatment.
Crop Use After Hail: Do not use for 8 weeks after treatment.
Succeeding Crops: No restrictions. Treated underseeded forages should not be grazed or harvested for feed during the year of seeding.

14. TOXICITY:

- has high acute toxicity to mammals
  oral LD_{50} rats = 270 mg/kg
- **short-term symptoms of poisoning may appear in man after use**
- no long-term health problems have been observed
- non-toxic to fish, birds and bees

15. PRECAUTIONS AND FIRST AID: Symptoms of poisoning include tiredness, diarrhaea, and constant urination. Avoid contact with skin and eyes, and do not inhale spray mist. Wear goggles and rubber gloves when handling.

- If on skin, wash off immediately with soap and water.
- If in eyes, flush with water for 15 minutes. Get prompt medical attention.
- If Avenge is swallowed, induce vomiting. Give plenty of milk or water to drink. Get medical attention.
- Take the labelled container with you.
- Take the information on Avenge in this booklet with you to doctor.

FOR PHYSICIAN: If swallowed, evacuate stomach immediately. Symptoms of poisoning – lethargy, diuresis, diarrhea, and prostration. Treat as for a quaternary ammonia compound.

16. STORAGE: Store in heated area. Crystals will form if stored below 5°C and whole mixture will freeze if temperature drops lower. Crystals can be redissolved by allowing the pail to lie on its side in a warm place (or the crystal layer can be quickly redissolved in hot water). Activity is not affected if crystals are redissolved and thoroughly mixed.

17. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain, Oliver Agricultural Supply, Federated Co-operatives, Pfizer Chemical Dealers, United Grain Growers, United Farmers of Alberta, Pioneer Grain.

Additional information available from:

Cyanamid Canada Inc.
Agricultural Products Department
7121H – 6 Street S.E.
Calgary, Alberta
T2H 2M8
Phone (Calgary): (403) 253-0924

In case of emergency endangering life or property involving this product, call collect, day or night: 1-416-356-8310.

BANVEL (dicamba)

1. FORMULATIONS: Solution, 400 g/L
Available in 10 L containers

2. REGISTERED MIXES: Banvel + 2,4-D amine
Banvel + 2,4-D amine + mecoprop (Kil-Mor)
Banvel + 2,4-D LV Ester
Banvel + MCPA amine
Banvel + MCPA-K (Dyvel)
Banvel + MCPA amine + mecoprop (Target)
Banvel + Sencor or Lexone

Mixing with other pesticides: Not recommended.

3. CROPS: Spring, durum and winter wheat, oats, barley, spring rye, field corn, pastures and rangeland grasses. noncrop areas (summerfallow and stubble), red fescue seed crops, canary seed and established turf.

Underseeding: Legume underseeding not recommended.

4. WEEDS CONTROLLED: Banvel alone will control buckwheat (Tartary and wild), corn spurry, cow cockle, green smartweed, lady's-thumb and cleavers. Registered Banvel tank mixes will control these weeds plus weeds controlled by the other herbicide in the mix.

5. WEEDS SUPPRESSED: Banvel will control top growth of Canada thistle, field bindweed and perennial sow-thistle at in-crop rates. At noncrop rates Banvel will eliminate these from summerfallow or fallow situations.

6. WHEN USED: Crop Stage

Recommended Leaf Stage (height) of Crop

CROP	BANVEL	BANVEL + 2,4-D Amine	BANVEL + MCPA Amine	BANVEL + MCPA-K	BANVEL + Metribuzin
Wheat (spring durum)	2-5	2-5	2-5	2-5	
Oats	2-5	—	2-5	2-5	—
Barley	2-5	2-5	2-5	2-5	2-3
Spring Rye	2-5	2-5	—	—	—
Wheat (Winter)	15-25 cm	15-25 cm	15-25 cm	15-25 cm	
Canary Seed	2-3		2-3		

Recommended Height of Corn

Corn	Banvel	Banvel + 2,4-D Amine
post-emergence Broadcast ground treatment	up to 30 cm	up to 15 cm
Directed post-emergence (drop-nozzles)	30-75 cm	15-75 cm

Pasture and Rangeland Grasses – When weeds are actively growing or when brush species under 2 m in height, Banvel alone, Banvel + 2,4-D Amine, Banvel + 2,4-D L.V. ester. (Do not use on timothy grown for seed).

Crop-Free Land – On summerfallow – cultivate in the spring and apply when thistles are in the early bud stage and field bindweed is in the flowering stage. Cultivate three weeks after treatment – Banvel alone.
On stubble – Apply to regrowth after harvest and at least two weeks prior to killing frost – Banvel alone.

Red Fescue – When new seedling stands are 5.0 cm tall Banvel alone, Banvel + 2,4-D Amine.
– In established stands up to the shot blade stage
– Banvel alone, Banvel + 2,4-D Amine.

Established Turf – Apply when weeds are actively growing – Banvel alone, Banvel + 2,4-D Amine.

7. HOW TO APPLY:

With: Ground equipment
Rate: Wheat (spring and durum), Oats, Spring Rye, Winter Wheat – 111-142 mL/ac **(275-350 mL/ha)**
Barley – 111 mL/ac **(275 mL/ha)**
Canary Seed – 142 mL/ac **(350 mL/ha)**
Corn and Red Fescue – 284 mL/ac **(700 mL/ha)**
Established Turf – 0.61 L/ac **(1.5 L/ha)**

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Crop Free Land – 1.2 L/ac **(3.0 L/ha)**
Pasture and Rangeland Grass – 0.31-2.23 L/ac **(0.75-5.5 L/ha).**
For registered mixes use the recommended rate of Banvel and the label recommended rate of the other herbicide.

Water Volume: Wheat, oats, barley spring rye – 45 L/ac **(110 L/ha)**
Corn – 90-140 L/ac **(220-350 L/ha)**
Pastures and Rangeland grasses – 45-90 L/ac **(110-220 L/ha)**
Red Fescue and canary seed – 45 L/ac **(110 L/ha)**
Established turf – 45 L/ac **(110 L/ha)**
Crop-Free Land – 45-90 L/ac **(110-220 L/ha)**
Incorporation: Not applicable
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: All standard nozzles delivering 45 L/ac **(110 L/ha)**
Protective Equipment: Standard protective equipment used when applying herbicides.

8. SPRAYING TIPS:

(a) Flat fan nozzles are more efficient than flooding tips.
(b) Do not spray if rain is expected within four hours of application.
(c) Best application is when crop is under good growing conditions and air temperature 10-25°C.
(d) Avoid application if risk of severe drop in night temperature is forecast.
(e) Avoid application when crop is under stress from adverse environmental conditions.
(f) Crop damage can occur if the chemical is applied at any time other than the recommended crop stage.

9. HOW IT WORKS:

Banvel is a systemic herbicide that is absorbed through the roots as well as the aerial parts of plants and translocated readily in the phloem and the xylem system of plants. The specific mode of action is unknown, although it is suspected that there is disruption of the normal metabolic and growth activities of the plant.

10. EXPECTED RESULTS:

Weeds: Results may take 10-14 days to appear. Proliferation of tissues in plant causes:
a) twisting, bending of main stem, leaf petioles
b) cupping of leaves
c) increase in root size
d) stimulation of fibrous root production.

Crops:
1. Under certain growing conditions shortening of straw can occur in treated crops without having adverse affect on crop yield.
2. If applied at other than recommended crop stage head and stem deformities may occur.
3. Crops under stress from adverse environmental conditions such as excess moisture, drought, disease, etc. may suffer a further setback when Banvel is applied. However, the crop injury that may occur is usually offset by the weed control obtained.

Conditions under which poor results may be expected:
1. Rain within four hours of application.
2. Application when weeds are at an advanced stage of growth.
3. Less than the recommended water volume.

11. EFFECTS OF RAINFALL: Rainfall four hours after application will not reduce effectiveness.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Do not apply (except as recommended) on or near desirable trees or plants, or in locations where chemical may be washed into contact with their roots.
Grazing Restrictions: Wheat, Barley, Oats, Spring Rye: Do not graze or harvest for livestock feed prior to crop maturity after treatment with Banvel or the registered Banvel tank mixes.
Corn: Do not graze cattle or harvest for silage until 7 days following treatment with Banvel alone or Banvel plus 2,4-D amine. Apply no later than 2 weeks prior to tassel emergence.
Succeeding Crops: No restrictions unless Banvel has been applied at 1.2 L/ac **(3.0 L/ha)** on crop free land. Then grow cereals or field corn the following year. If this crop free application is made after September 1 or if soil moisture levels are extremely low subsequent to application, crop injury may occur in the spring following application.
Canary Seed: Canary seed should be used only as bird seed.
Pastures and Rangeland Grasses:

GRAZING AND HAY MAKING RESTRICTIONS FOR DAIRY CATTLE

Rate Per Acre	Rate Per Hectare	Days Delay Between Treatment and Grazing or Cutting For Hay For Dairy Cattle
Up to 0.6 L Banvel	**Up to 1.5 L Banvel**	0
0.6-1.1 L Banvel	**1.5-2.75 L Banvel**	7
1.1-2.2 L Banvel	**2.75-5.50 L Banvel**	14
2.2-4.4 L Banvel	**5.50-11.0 L Banvel**	30

1. If treated vegetation has been consumed by meat animals within 30 days of Banvel application, feed the animal with untreated diet for 30 days before slaughter.
2. Meat animals may graze or feed on treated pastures 30 days after Banvel application without restrictions on slaughter.

14. TOXICITY:

- has low acute mammalian toxicity
  oral LD_{50} – 1,707-2,900 mg/kg (technical)
- **may cause mild skin irritation and extreme eye irritation and swelling after short-term use**
- no long-term health problems have been observed from this product
- non-toxic to fish and birds

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes and do not inhale spray mist.
    - If on skin, wash with soap and water.
    - If in eyes, flush for 15 minutes and get medical attention.
    - If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
    - Take labelled container with you to doctor.

16. STORAGE: Protect from freezing but if frozen, no activity is lost if completely resuspended. Product stores indefinitely.

17. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain, Pioneer Grain, United Grain Growers, Federated Co-operatives, Green Cross Product Dealers, Oliver Agricultural Supply, Pfizer Chemical Dealers.

Additional information available from:

Velsicol Corporation of Canada Limited
1360 Blundell Road
Mississauga, Ontario
L4Y 1M5
Phone: (416) 270-5112

BASAGRAN (bentazon)

1. FORMULATIONS: Basagran SN – 480 g/L
   Available in 10 L containers

2. REGISTERED MIXES: None

3. CROPS: Soybeans, lima beans, most dry and snap common beans, field and sweet corn, peas, fababeans, flax.

   Underseeding: Not recommended

4. WEEDS CONTROLLED: Black nightshade, bindweed (field), buttercup, cocklebur, common chickweed, common groundsel*, corn spurry, hairy galinsoga, lamb's-quarters*, mustard (wild), pigweed (redroot)*, purslane, ragweed (common and giant), smartweed, thistle (Canada and Russian), Venice mallow, stinkweed, shepherd's-purse.

   * Triazine resistant species.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Consult label for correct timing on weeds of major importance. Generally, the best timing is 18 to 28 days after planting. Soybeans, most dry and snap common beans, and corn are tolerant at all growth stages.

   Peas can be treated with Basagran only after 3 pairs of leaves (or 3 nodes) are present. Fababeans may be treated with Basagran when the crop has 2-4 leaves, or is at least 10 cm tall.

   Flax may be treated with Basagran when it is 5 cm or taller.

7. HOW TO APPLY:

With:	Ground or aerial equipment
Rate:	All crops – 0.7-0.9 L/ac **(1.75-2.25 L/ha)**. The addition of Assist oil concentrate at 10 L/1,000 L of spray volume is recommended for optimum performance. The use of Assist oil concentrate **is not** recommended for peas. Cittowett Plus at 2.5 L per 1,000 L of spray volume may be used instead but not for flax or fababeans.
Water Volume:	80-160 L/ac **(200-400 L/ha)** by ground. 20-40 L/ac **(50-100 L/ha)** by air.
Incorporation:	Not applicable.
Pressure:	275-425 kPa
Ground Speed:	5-9 km/h
Nozzles:	Do not use flood jet nozzles. Flat fan nozzles provide the best coverage.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of the emulsifiable concentrate.

8. SPRAYING TIPS: Basagran is most effective when weeds are young and growing actively and when temperatures are warm (greater than 21°C).

9. HOW IT WORKS: Basagran is a contact herbicide. It acts by interfering with photosynthetic processes. In resistant plants, it is metabolized to a non-toxic product.

10. EXPECTED RESULTS:

    Weeds: Weeds turn yellow initially and then brown, usually within two weeks.

    Crops: A slight leaf-yellowing, bronzing, speckling or burning may occur under certain conditions. The crop usually outgrows the condition within 10 days.

    Conditions under which poor results may be expected:
    1. Weeds beyond recommended growth stage.
    2. Failure to penetrate crop or weed canopies resulting in poor coverage.
    3. Poor growing conditions such as cool weather or drought.

11. EFFECTS OF RAINFALL: Rainfall within 6-8 hours of application may reduce activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Avoid drift on to susceptible crops such as rapeseed and mustard.
    Grazing Restrictions: Do not feed green plants to livestock.
    Succeeding Crops: No restrictions.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

14. TOXICITY:

- has low acute toxicity to mammals
  oral LD_{50} rats = 850 mg/kg (technical)
- no short-term or long-term health problems have been associated with this product
- slightly toxic to fish LC_{50} = 190 ppm; non-toxic to birds and bees

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes and do not inhale spray mist.

- If on skin, wash thoroughly with soap and water.
- If in eyes, flush for 15 minutes with clean water. Get medical attention.
- If swallowed, **do not induce vomiting because of petroleum distillates. See a doctor immediately.**
- Take labelled container with you.

16. STORAGE: Basagran should be stored in a heated place. However, freezing will not affect activity. If frozen, warm to room temperature and shake well.

17. AVAILABLE FROM: Oliver Agricultural Supply.

Additional information available from:

BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario
M9W 1K1
Phone: (416) 675-3611

BASF Canada Inc.
1705 Norcen Tower
715-5th Avenue, S.W.
Calgary, Alberta
T2P 2X6
Phone: (403) 237-6661

BASFAPON (dalapon)

1. FORMULATIONS: 74% soluble powder.
   Available in a 25 kg fiber drum.

2. REGISTERED MIXES: Basfapon may be mixed with 2,4-DB, 2,4-D, MCPA, MCPB, diuron, linuron, monolinuron.

   Mix restrictions: Mix Basfapon with water first, then add the other weed killer. Closely follow label directions of other weed killer.
   Mixing with other pesticides: Not recommended.

3. CROPS: Fallowland, potatoes, rapeseed, flax, asparagus, raspberries, peas, buckwheat, sugar beets.

   Underseeding: Not recommended.

4. WEEDS CONTROLLED: Annual grasses, barnyard grass, green foxtail quackgrass.

5. WEEDS SUPPRESSED: None

6. WHEN USED:

   - Pre-plant or Summerfallow: In spring when grass is 10-15 cm high or in fall when grass is actively growing.
   - Potatoes: In spring before plowing when grass is 10-15 cm high; after emergence of the grasses but before the emergence of the potatoes.
   - Asparagus: after cutting.
   - Raspberries: in fall only.
   - Peas: When peas are 10-15 cm high and at least 25 days prior to harvest.
   - Flax: When flax is 10-15 cm tall and when grasses are in the 1-3 leaf stage.
   - Rapeseed: When the crop plants are in the 2-4 leaf stage and grasses in the 1-3 leaf stage.
   - Buckwheat: When buckwheat is in the 1-3 leaf stage.
   - Sugar Beets: When beets are in 2-4 leaf stage and annual grasses are in the 1-3 leaf stage.

7. HOW TO APPLY:

   With: Ground equipment
   Rate: Fallow or Pre-plant – 11.1-13.1 kg/ac **(27.5-32.5 kg/ha)**
   Potatoes (Quackgrass control) – 7.1-9.1 kg/ac **(17.5-22.5 kg/ha)** pre-plant.
   Potatoes (seedling grasses) – 2.2-3.1 kg/ac **(5.50-7.75 kg/ha)**
   Asparagus – 1.3-2.7 kg/ac **(3.25-6.75 kg/ha)**
   Raspberries – 4.5 kg/ac **(11 kg/ha)**
   Peas, Flax, Rapeseed – 0.45-0.71 kg/ac **(1.1-1.75 kg/ha)**
   Buckwheat – 0.22-0.34 kg/ac **(0.55-0.85 kg/ha)**
   Sugar Beets – 0.45-0.71 kg in 40-60 L of water/ac **(1.1-1.75 kg in 100-150 L of water/ha)** at 0.45 kg/ac **(1.1 kg/ha)** rate, one 25 kg drum will treat 55.5 ac (22.7 ha)
   Water Volume: 40-160 L/ac **(100-400 L/ha)**
   Incorporation: Not applicable
   Pressure: 275 kPa
   Ground Speed: 9 km/h
   Nozzles: All standard and low pressure nozzles delivering 40 L/ac **(100 L/ha)** or more.
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a respirator and goggles when opening containers.

8. SPRAYING TIPS: Grasses will be controlled better under good growing conditions.

9. HOW IT WORKS: Basfapon is absorbed by both roots and leaves, and is translocated to young growing tissue, where it interferes with metabolic processes.

10. EXPECTED RESULTS: Plants stop growing and eventually die. It may take up to three weeks for complete control to occur. Under poor growing conditions, such as drought or cold weather, results may be poor.

11. EFFECTS OF RAINFALL: Rainfall shortly after application may reduce control.

12. MOVEMENT IN SOIL:

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Avoid drift on to susceptible crops.
    Grazing Restrictions: To avoid the possibility of residues in meat or milk, do not graze or feed Basfapon treated grass or foliage to meat or dairy animals during the crop year of application.
    Cropping Restrictions: Potatoes can be safely planted 4 days after treatment. Sensitive crops such as grass, small grains, corn or beans should not be planted for at least 30 days after treatment.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

14. TOXICITY:
    - has very low acute toxicity to mammals
      oral LD_{50} rats = 9,300 mg/kg
    - no short-term or long-term health problems associated with this product
    - non-toxic to fish and birds

15. PRECAUTIONS AND FIRST AID: May cause mild burn if in contact with skin for sometime. Avoid skin and eye contact.
    - If on skin, wash immediately with soap and water.
    - If in eyes, flush for 15 minutes with clean water. Get medical attention.

16. STORAGE: Store in a cool, dry place. Do not store below 0°C.

17. WHERE AVAILABLE: Alberta Wheat Pool, United Grain Growers.

Additional information available from:

BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario
M9W 1K1
Phone: (416) 675-3611

BENAZOLIN (benazolin)

1. FORMULATIONS: Water soluble solution 350 g/L
   Available in 4 L containers
2. REGISTERED MIXES: None
3. CROPS: Rapeseed

   Underseeding: Not recommended.
4. WEEDS CONTROLLED: Wild mustard
5. WEEDS SUPPRESSED: Canada thistle
6. WHEN USED: When rapeseed plants have 2-3 leaves and mustard plants have 2-4 leaves.
7. HOW TO APPLY:

With:	No equipment restrictions specified
Rate:	0.6-0.85 L/ac **(1.5-2.1 L/ha)** [at 0.6 L/ac **(1.5 L/ha)** rate, one 4 L container will treat 6.7 ac (2.7 ha)]
Water Volume:	20-40 L/ac **(50-100 L/ha)**
Pressure:	Sufficient to provide good coverage
Ground Speed:	No restrictions specified
Nozzles:	Those capable of providing 20-40 L/ac **(50-100 L/ha)** with complete coverage.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of the concentrated liquid.

8. SPRAYING TIPS: Remove all traces of 2,4-D or MCPA or other herbicides from sprayer before spraying rapeseed – this is **absolutely essential.** Good spray coverage is essential.
9. HOW IT WORKS: The primary mode of action has not yet been determined.
10. EXPECTED RESULTS: A kill or suppression of the wild mustard and thus a reduction in its competitive ability.
11. EFFECTS OF RAINFALL: Do not spray if rain is expected within 4 hours.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Avoid spray drift onto cereals, forage pasture and ornamental plants.
    Grazing Restrictions: None specified
    Crop Use After Hail: No restrictions specified
    Succeeding Crops: No restrictions
14. TOXICITY:
    - has very low acute mammalian toxicity
      oral LD_{50} rats = 3,000 mg/ka
    - may irritate skin and eyes
    - no short-term or long-term human health problems observed
    - not toxic to birds; slightly toxic to fish (LC_{50} 24 hours = 108 ppm)
15. PRECAUTIONS AND FIRST AID: Do not get on skin or in eyes, and do not breathe spray mist.
    - If on skin, wash with soap and water. If irritation persists, see a doctor.
    - If in eyes, flush for 15 minutes with clean water. Get medical attention.
    - If swallowed, wash out mouth thoroughly, give water to drink and obtain medical attention.
    - Take labelled container with you to doctor.
16. STORAGE: Heated storage is definitely required.
17. WHERE AVAILABLE: Green Cross Product Dealers

    Additional information available from:

    Green Cross Products
    820 – 26th Street N.E.
    Calgary, Alberta
    T2A 2M4
    Phone: (403) 273-5656

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

BLADEX (cyanazine)

1. FORMULATIONS: Bladex 80W (80% wettable powder), 5 kg bags.
   Bladex Liquid (480 g/L), 10 L jugs.

2. REGISTERED MIXES: Bladex + Atrazine

3. CROPS: Corn (field and sweet)

4. WEEDS CONTROLLED: A range of annual grass and broad-leaf species such as green foxtail, wild buckwheat, annual smartweed species, lamb's-quarters, mustard (wild, wormseed).

5. WEEDS SUPPRESSED: None

6. WHEN USED: Pre-emergent treatment with irrigation within 5-7 days after application.

7. HOW TO APPLY:

With: Ground equipment
Rate: 1.1-1.7 kg/ac **(2.75-4.25 kg/ha)** Bladex 80W or 1.9-2.8 L/ac **(4.75-7.0 L/ha)** Bladex Liquid, or 0.9-1.1 kg/ac **(2.25-2.75 kg/ha)** Bladex 80W or 1.52-1.9 L/ac **(3.75-4.75 L/ha)** Bladex Liquid plus 0.6-0.9 kg/ac **(1.5-2.25 kg/ha)** Atrazine 80W. Use the lower rates for light textured soils and the higher rates for medium textured soils (loams). Do not use Bladex on soils with more than 70% sand or less than 1% organic matter.
Water Volume: 60-120 L/ac **(150-300 L/ha)**
Pressure: 200-300 kPa
Ground Speed: No restrictions
Nozzles: Those capable of applying a uniform spray at the required water volume, eg. Tee-Jet 8003 or larger.
Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a respirator and goggles when opening bags.
- plus a face shield and apron when opening liquid containers.

8. SPRAYING TIPS:

(a) Partially fill sprayer tank with water; engage agitation system and slowly add Bladex to sprayer tank.
(b) When tank mixing Bladex with Atrazine, pre-mix Atrazine 80W with water in pail. Add pre-mix to spray tank. After Atrazine is fully suspended add Bladex.
(c) Maintain continuous agitation.
(d) Do not use strainers or screens smaller than 50 mesh. Do not use felt filters.

9. HOW IT WORKS: Bladex interferes with the photosynthetic process in susceptible weeds.

10. EXPECTED RESULTS: Weeds fail to emerge or die back shortly after emergence. A weed should be considered an escape if it reaches the 2-3 leaf stage. Bladex treatments are active primarily through the roots, therefore, effective control is dependent on sufficient moisture to move the herbicide into the root zone.

11. EFFECTS OF RAINFALL: Rainfall or irrigation is required to activate Bladex. Very heavy rainfall on light sandy soils can cause some leaching and reduce the effectiveness of the herbicide.

12. MOVEMENT IN SOIL: Negligible, unless excess moisture is associated with a very sandy soil.

13. CROPPING AND GRAZING RESTRICTIONS: Where the Bladex + Atrazine 80W tank mixture is used corn should follow corn. Avoid drift onto adjacent crops and fields.

14. TOXICITY:
- has slightly high acute mammalian toxicity
  oral LD_{50} rats = 334 mg/kg
- has very low dermal toxicity
- dermal LD_{50} rabbits = greater than 2,000 mg/kg
- no short-term or long-term human health problems observed
- low toxicity to birds and fish

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist.
- If on skin, wash with soap and water.
- If in eyes, flush for 15 minutes with clean water. Get medical attention.
- If swallowed, induce vomiting. Give plenty of milk or water to drink. Get medical attention.
- Take labelled container with you to doctor.

16. STORAGE: Bladex 80W should be stored in a dry place. Do not allow Bladex Liquid to freeze.

17. WHERE AVAILABLE: Green Cross Product Dealers, Alberta Wheat Pool, Federated Co-operated and United Grain Growers.

Additional information available from:

Ciba Geigy/Green Cross Products
820 – 26 Street NE
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

BLAGAL (cyanazine + MCPA-K)

1. FORMULATIONS: Suspension concentrate 125 g/L of cyanazine and 250 g/L of MCPA-K.
   Available in a carton containing two 10 L containers.

2. REGISTERED MIXES: None registered nor recommended.

3. CROPS: All varieties of spring wheat, barley and oats (not undersown to forage crops), flax.

   Underseeding: Not recommended.

4. WEEDS CONTROLLED: Buckwheat (Tartary and wild), chickweed, corn spurry, hemp-nettle, lamb's-quarters, mustards (ball, tumble, wild, wormseed), pigweed (redroot), smartweeds (annual), stinkweed, plus other MCPA-K susceptible weeds.

5. WEEDS SUPPRESSED: Top growth control of Canada thistle and horsetail.

6. WHEN USED:

   When cereals are in the 2-5 leaf stage; when flax is 5-10 cm in height. Best weed control will be achieved when the weeds are small and actively growing, preferably before the 5 leaf stage. Weeds should be past the cotyledon stage (first two leaves to appear). For best results on Canada thistle, delay application until wheat, barley and oats have reached the 5 leaf stage.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	0.91 L/ac **(2.25 L/ha)** one 10 L container treats 10.8 ac (4.4 ha)
Incorporation:	Not applicable
Water Volume:	Minimum 40 L/ac **(100 L/ha)**
Nozzles:	50 mesh or larger, flat fan nozzles (examples: 6502, 8002)
Pressure:	275 kPa
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated chemical.

8. SPRAYING TIPS:

Timing:	Late application past the 5 leaf stage may cause serious crop injury and possibly poor weed control.
Sprayer:	The sprayer must be equipped with a 50 mesh or larger screen filter and nozzle screens or plugging could be a problem (no felt filters). The pump must have sufficient capacity to supply the necessary pressure to the nozzles as well as allow for by-pass or jet-agitation mixing while spraying. Vigorous agitation may be necessary if the solution is allowed to stand in the sprayer tank several hours or longer.
Nozzles:	80° nozzles generally provide better weed control than 65° nozzles. Do not use Flood Jet nozzles.
Ground Speed:	Preferably 8 km/h or less.
Boom angle:	Direct the spray pattern straight downward to obtain maximum coverage.
Rainfall:	Do not apply if rainfall is expected within 4 hours.
Other Pesticide Interval:	4 days should be allowed before or after a wild oat herbicide application.

9. HOW IT WORKS: Blagal is a post-emergent systemic herbicide which inhibits photosynthesis in the weed. Cyanazine and MCPA act synergistically to provide weed control. The MCPA contributes by breaking down the natural barriers of the plant cuticle, allowing the cyanazine more ready access to the photosynthetic mechanism of the weed. Death of the weed occurs due to the inhibition of the photosynthetic process. The first sign of activity will appear in 5-10 days.

10. EXPECTED RESULTS:

    Weeds: 5-10 days after spraying, yellow blotches appear which spread until the plant turns yellow and brown and dies. Young, vigorous plants will be affected first.

    Crop: If the crop is under stress (from lack of moisture or extreme temperature), Blagal may temporarily cause a yellowing of the lower leaves of the crop. However, the crop will recover quickly and any subsequent effect on crop growth and yield will be more than offset by the weed control obtained.

    Conditions under which poor results may be expected:
    1. Rain within 4 hours of application.
    2. Reduced application rate.
    3. Poor coverage due to wind, low water volume, or dense crop canopy.
    4. Extremely poor growing conditions, i.e. drought.
    5. Late application.

11. EFFECTS OF RAINFALL: Rainfall within 4 hours will seriously decrease activity.

12. MOVEMENT IN SOIL: Not applicable.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger is low, however, care must be used around shelterbelts and sensitive broad-leaved crops especially rapeseed.
Grazing Restrictions: Do not graze or feed green plants to livestock.
Crop Use After Hail: May be used if mature.
Succeeding Crops: No restrictions.

14. TOXICITY:

- has low acute mammalian toxicity
  cyanazine: oral LD_{50} rats = 334 mg/kg
  MCPA = oral LD_{50} rats = 700 mg/kg
- no short-term or long-term human health problems have been associated with this product
- non-toxic to fish, birds and bees

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist.

- If on skin, wash with soap and water.
- If in eyes, flush for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Do not allow to freeze. Blagal may settle if stored below 0°C. It can be re-suspended if allowed to warm and then shaken. Activity is not affected if all the settled material is re-suspended.

17. WHERE AVAILABLE: Shell Farm Supply Dealers, Co-op Farm Supply Centres, Alberta Wheat Pool, United Grain Growers, Green Cross Product Dealers, Pioneer Grain, and many independent agrochemical dealers.

Additional information available from:

Ciba Geigy/Green Cross Products
820 – 26 Street NE
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

BROMINAL-M/BROMOX 450M (bromoxynil + MCPA)

1. FORMULATIONS: Emulsifiable concentrate, 450 g/L (225 g/L
bromoxynil + 225 g/L MCPA).
Bromox 450M available in 10 L containers.
Brominal-M available in 20 L containers.

2. REGISTERED MIXES: Brominal-M + Avenge
Bromox 450M + Avenge
Brominal-M + MCPA Ester
Bromox 450M + MCPA Ester

Mix restrictions: Fill the sprayer tank half full with clean water, then add the required amount of Brominal-M or Bromox 450M and mix thoroughly. Fill tank with water, add Avenge and mix again before spraying.
Mixing with other pesticides: Not recommended

3. CROPS: Spring wheat, barley, oats, flax and canary seed.

Underseeding: Not recommended.

4. WEEDS CONTROLLED: Wild buckwheat, Tartary buckwheat, annual smartweeds, stinkweed, redroot pigweed, lamb's-quarters, mustard (ball, tumble, wild, wormseed), cow cockle, Russian thistle, bluebur, common pigweed, flixweed, shepherd's-purse, scentless chamomile, volunteer sunflower, volunteer rapeseed, common buckwheat, common groundsel, kochia and knawel.

5. WEEDS SUPPRESSED: Canada thistle, perennial sow-thistle.

6. WHEN USED:

- Spray before weeds are past the 4-5 leaf stage.
- Wheat, Barley and Oats: 2 leaf to early flag leaf stage.
- Flax: 5-10 cm high.
- Canary Seed: 3-5 leaf stage.

7. HOW TO APPLY:

With:	Aircraft or ground equipment.
Rate:	0.51 L/ac **(1.25 L/ha)** [one 10 L container treats 19.77 ac (8 ha)].
Water Volume:	Aircraft – 8 L/ac **(20 L/ha)** or more, 16-20 L/ac **(40-50 L/ha)** preferred. Ground – 20 L or more/ac **(50 or more L/ha)** Incorporation: not applicable
Pressure:	275 kPa
Ground Speed:	6.5-8 km/h
Nozzles:	Flood Jet nozzles are not recommended.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

(a) Avoid spraying during a severe drought. Under conditions of high temperature and humidity, slight discolouration of cereals may occur. However, this has not resulted in permanent injury and has not reduced crop yields.
(b) Flax is less tolerant to Brominal-M/Bromox 450M than cereals, therefore avoid spraying flax under hot, humid weather and daytime temperatures over 29°C.
(c) Adequate spray coverage is important.

9. HOW IT WORKS: Bromoxynil is absorbed by the foliage but is not translocated once absorbed. Inhibits photosynthesis and plant respiration. MCPA is absorbed through leaves and is readily translocated in the plant. Has systemic action.

10. EXPECTED RESULTS:

Broad-leaf weeds: Affected plants will turn brown within 3-5 days of application.

Flax: Flax is less tolerant of this product than are cereal crops. Some leaf burn and retarded growth may delay maturity 2 to 3 days.

Conditions under which poor results may be expected:
1. Late spraying: majority of the weeds past the 5-6 leaf stage.
2. Inadequate spray coverage.
3. Too low a spray pressure.

11. EFFECTS OF RAINFALL: Rainfall within 2 hours may decrease effectiveness.

12. MOVEMENT IN SOIL: Not applicable.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Avoid spray drift
Grazing Restrictions: No restrictions
Crop Use After Hail: No restrictions

14. TOXICITY:
- has high acute mammalian toxicity
  oral LD_{50} rats = 250 mg/kg
- **symptoms of poisoning may occur in man shortly after use**
- no long-term human health problems have been associated with Bromox 450M or Brominal-M
- very toxic to fish and birds; do not contaminate water or feed.

15. PRECAUTIONS AND FIRST AID: Avoid getting this product on the skin or in the eyes, and do not inhale spray mist. May produce symptoms of poisoning.

- If on skin, wash **immediately** with soap and water.
- If in eyes, flush with clean water for 15 minutes and get medical attention. MCPA is eye irritant.
- If swallowed, **do not induce vomiting**. See a doctor immediately.
- Take labelled container to doctor.

16. STORAGE: Store in heated area. Do not freeze.
Brominal-M/Bromox 450M may crystallize if frozen. If crystallization has taken place, warm the drum in a warm room or sun, with frequent agitation, until crystals are dissolved.

17. WHERE AVAILABLE: Pfizer Chemical Dealers, United Grain Growers, Cargill Grain, Federated Co-operatives, United Farmers of Alberta, Niagara Chemical Dealers and Oliver Dealers.

Additional information available from:

Allied Chemical Services Ltd.
5507 – 1st Street S.E.
Calgary, Alberta
T2H 1H9
Phone: (403) 253-8471

BUCTRIL M (bromoxynil + MCPA)

1. FORMULATIONS: 450 g/L (225 g/L bromoxynil, 225 g/L MCPA)
   Available in 20 L containers
   During 1984 a new formulation of Buctril M will be introduced – 562 g/L (281 g/L bromoxynil + 281 g/L MCPA). Container size – 16 L. Application rate will be reduced to 0.4 L/ac **(1.0 L/ha)**
   [One 16 L container will treat 39.5 ac **(16 ha)**].

2. REGISTERED MIXES: Buctril M + Asulox F
   Buctril M + Atrazine
   Buctril M + Avenge
   Buctril M + MCPA (ester)
   Buctril M + TCA (in barley)

   Mix Restrictions: Add Buctril M to Asulox F already mixed in the spray tank.

3. CROPS: Spring wheat (including durum), barley, oats, flax, corn (field and sweet Buctril M alone or tank mixed with Atrazine). Seedling grasses – grown for seed production, in the year of establishment only and not underseeded to legumes, brome grass, crested wheat grass, Intermediate wheat grass, slender wheat grass, tall wheat grass, Russian wild rye, timothy, orchard grass, creeping red rescue, meadow fescue, canary seed, fall rye, winter wheat (spring application).

   Underseeded: Not recommended.

4. WEEDS CONTROLLED: Bluebur, buckwheat (common, Tartary and wild), Canada thistle*, common groundsel, cocklebur, common ragweed, cow cockle (up to 4 leaf stage), flixweed, hemp-nettle*, green foxtail**, lamb's-quarters, mustards (ball and wild), night flowering catchfly, perennial sow-thistle, redroot pigweed, Russian thistle, scentless chamomile, shepherd'spurse, smartweeds (annual), stinkweed, velvetleaf (before 8 cm high), volunteer rapeseed, volunteer sunflower, kochia (before 5 cm high).

   * Tank mix with MCPA, MCPA-K preferred.
   ** Tank mix with TCA

5. WEEDS SUPPRESSED: Not applicable.

6. WHEN USED:

   Cereals – 2 leaf to early flag leaf stage, when weeds are in seedling stage. Winter wheat, fall rye – spring application.
   Corn – 4-6 leaf stage, for overall application.
   Flax – 5-10 cm high.
   Seedling Grasses – 2-4 leaf stage.
   Canary Seed – 3-5 leaf stage.

7. HOW TO APPLY:

   With: Ground equipment or by aircraft
   Rate: 0.51 L/ac **(1.25 L/ha)**
   One 20 L container treats 39.5 ac at the 0.51 L/ac **rate**
   (One 20 L container treats 16 ha at the 1.25 L/ha rate)
   Water Volume: Not less than 20-40 L/ac **(50-100 L/ha)** – in corn use 80-120 L/ac **(200-300 L/ha)**
   Incorporation: Not applicable
   Pressure: 275 kPa
   Nozzles: All flat fan nozzles delivering not less than 20 L/ac **(50 L/ha)**. Flooding tips are not recommended.
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a face shield and apron when opening containers of concentrated liquids.

8. SPRAYING TIPS: Spray when weeds are in the seedling stage.

   Barley: A tank-mix of Buctril M plus TCA (dry or liquid) is recommended. The standard rates of both products are recommended. 0.51 L/ac Buctril M + 0.71 L/ac TCA solution or 0.54 kg/ac of NaTA **(1.25 L/ha Buctril M + 1.75 L/ha TCA solution or 1.34 kg/ha of NaTA product)**. Observe precautions and restrictions on both product labels.

   Corn: Buctril M at the standard 0.51 L/ac **(1.25 L/ha)** rate may be applied as an overall spray to corn in the 4-6 leaf stage. 80-120 L/ac **(200-300 L/ha)** of water should be used in this application.

   Buctril M (as above) plus Atrazine at 0.45-0.91 kg active/ac **(1.1-2.25 kg active ingredient/ha)** is recommended for broader spectrum weed control. Do not add oil or surfactant. Add Atrazine to the tank first. Observe precautions and limitations of both product labels. Temporary crop injury (leaf scorching) may occur in adverse growing conditions, especially if applied after periods of wet, or hot and humid weather. Cultivation after application is not recommended.

   Seedling Grasses (not underseeded to legumes in the year of establishment).
   Buctril M at the standard 0.51 L/ac **(1.25 L/ha)** rate may be applied in the 2-4 leaf stage in 60 L/ac **(150 L/ha)** of water.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

9. HOW IT WORKS: Buctril M is a contact type herbicide, therefore, good spray coverage is essential. Bromoxynil is absorbed by the foliage but is not translocated once absorbed. Inhibits photosynthesis and plant respiration. MCPA is absorbed through leaves and is readily translocated in the plant. Has systemic action.

10. EXPECTED RESULTS: Within a few hours or several days, depending on the weather, small areas of burnt tissue will appear on the leaves of the weeds. Complete death of the weeds will be evident in 1-2 weeks.

    Conditions under which poor results may be expected:
    1. Poor spray coverage.
    2. Using less than the recommended rate of 0.51 L/ac **(1.25 L/ha)**.
    3. Spraying flax when plants are non-vigorous or under stress or in periods of hot, humid weather may cause crop damage.
    4. Not spraying weeds when they are in the seedling stage.
    5. Applying after the crop shields the weeds.

11. EFFECTS OF RAINFALL: No effect

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS: No grazing or crop use restrictions.

14. TOXICITY:

    - has low acute mammalian toxicity
      oral LD_{50} rats = 365 mg/kg
    - no short-term or long-term human health problems have been associated with this product
    - very toxic to fish and birds; non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale fumes and spray mist.

    - If on skin, wash with soap and water.
    - If in eyes, flush with water for 15 minutes and get medical attention.
    - If swallowed, **do not induce vomiting**. See a doctor.
    - Take labelled container to doctor.

16. STORAGE: Store in heated area. Buctril M may crystallize if frozen. If crystallization has taken place, warm the drum in a warm room or sun with frequent agitation until crystals are dissolved.

17. WHERE AVAILABLE: Alberta Wheat Pool, Oliver Agricultural Supply, Pioneer Grain, Cargill Grain, King Agri Serv, Chipman Inc.

    Additional information available from:

    May & Baker Canada Inc.
    1865 Sargent Avenue
    Bay #2
    Winnipeg, Manitoba
    R3H OE4
    Phone: (204) 774-1819

CALMIX (bromacil + 2,4-D)

1. FORMULATIONS: Pellets, Bromacil – 3.00% + 2,4-D – 5.00%
   Available in 1, 5 & 25 kg containers

2. REGISTERED MIXES: None registered

   Mix restrictions: Not applicable
   Mixing with other pesticides: Not recommended

3. CROPS: Non-crop land only.

   Underseeded: Not applicable

4. WEEDS CONTROLLED: Non-selective. Controls annual and perennial weeds. (See label for specifics.)

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Calmix may be used during the growing season, but to prevent growth apply in early spring or fall.

7. HOW TO APPLY:

   With: Calmix spreader or shaker.
   Rate: 2.5 kg/100 sq. m. Annual weeds and perennial seedlings.
   3.75 kg/100 sq. m. Shallow-rooted perennials.
   5.0 kg/100 sq. m. Heavy perennial growth.
   – Apply at the higher rate to heavier soils and/or to extend the growth control period.
   – For spot treatment apply 375 g to about 1 sq. m. Repeat treatment when required.
   – For treatment around power poles, treat 1.25 m around each pole (approximately 5.0 sq. m). Use about 250 g/pole.
   Water Volume: Not applicable
   Incorporation: Not applicable
   Pressure: Not applicable
   Ground Speed: Not applicable
   Nozzles: Not applicable
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a respirator and goggles when opening Calmix bags.

8. SPRAYING TIPS:

   (a) Do not use near lawns, flower beds or desirable trees and plants.
   (b) Calmix should not be applied closer than 1 times the height of nearby trees.

9. HOW IT WORKS: Calmix Pellets are applied on the soil surface where a small amount of rainfall will activate the chemical and move it down into the root zone. As the chemical goes deeper, shallow-rooted weeds die and the deeper-rooted weeds show signs of chemical activity. This progresses until the entire weed population is dead. Once fixed in the soil, Calmix does not move laterally.

10. EXPECTED RESULTS: Vegetation present turns brown and dies. No new weed growth will appear, resulting in bare ground. Duration of control will depend upon amount of chemical applied, soil type and environmental conditions.

    Conditions under which poor results may be expected:
    1. Inadequate application rate.
    2. Soil erosion removes chemical from treated area when applied on slopes.

11. EFFECTS OF RAINFALL: Moisture will activate and carry the herbicide into the root zone.

12. MOVEMENT IN SOIL: Once fixed in the soil, Calmix will not move laterally or leach down into the ground. Pellets can be carried by erosion.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Not applicable
    Grazing Restrictions: Not applicable
    Crop Use After Hail: Not applicable
    Succeeding Crops: Calmix is a total vegetation control chemical, for use only on non-cropland, where bare ground is desired.

14. TOXICITY

    – has low acute mammalian toxicity
    bromacil: oral LD_{50} rats = 5,200 mg/kg
    2,4-D: oral LD_{50} rats = 375 mg/kg

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

- no short-term or long-term human health problems have been associated with this product
- slight toxicity to fish; non-toxic to birds.

The 2,4-D in this product does not contain dioxin.

15. PRECAUTIONS AND FIRST AID: Avoid breathing dust from the pellets.

    - If on skin, wash with soap and water.
    - If in eyes, flush for 15 minutes and get medical attention.

16. STORAGE: Store in dry area.

17. WHERE AVAILABLE: United Farmers of Alberta, United Grain Growers, Shell Farm Supply Dealers, Niagara Chemical Dealers, Pioneer Grain, Cargill Grain, Federated Co-operatives, Midland Vegetation Control Inc.

Additional information available from:

Allied Chemical Services Ltd.
5507 – 1st Street S.E.
Calgary, Alberta
T2H 1H9
Phone: (403) 253-8471

CARBYNE 2EC (barban)

1. FORMULATIONS: Emulsifiable concentrate 240 g/L
   Available in 19 L containers

2. REGISTERED MIXES: No registered mixes.

   Mixing with other pesticides: Not recommended

3. CROPS: Spring wheat, durum wheat, barley, rapeseed, mustard, flax, sunflower, peas (field and processing), fababeans, lentils, alfalfa, red clover, alsike clover, sweet clover, smooth bromegrass, timothy*, Russian wild ryegrass, creeping red fescue*, crested wheatgrass*, and sugar beets.

   * Seed stands only.

   Underseeding: Carbyne can be used on the above crops underseeded to one or more of the above forage legume and grass species.

4. WEEDS CONTROLLED: Wild oats

5. WEEDS SUPPRESSED: None

6. WHEN USED: When the majority of wild oats are in the 2 leaf stage but before the crop reaches the following growth stages:

Wheat (spring, durum), barley, lentils	Before the fourth leaf appears or before the 14th day after emergence.
Flax	After the 2 (true) leaf stage but before the 12th leaf appears and before the 14th day after emergence.
Peas	Before the 6th leaf appears.
Alfalfa, sweet clover, red clover, alsike clover, smooth bromegrass, Russain wild rye	Before the 4th leaf appears.
Timothy, creeping red fescue, crested wheatgrass	Before the 4th leaf appears and only when grown for seed and in year of seeding.
Rapeseed, mustard, sunflower, fababeans, sugar beets	May be sprayed at any time the wild oats are in the 2 leaf stage.

7. HOW TO APPLY:

With:	Aircraft or ground equipment
Rate:	To all crops apply 0.61-0.71 L/ac **(1.50-1.75 L/ha)**. On all crops use the lower rate only under good growing conditions, when the wild oats have reached the 2 leaf stage in less than 10 days after emergence. Use the higher rate on heavy infestations (50 or more wild oat plants/1,000 sq. cm.) under poor growing conditions, or when wild oats have been injured by frost or wind. [At 0.61 L/ac **(1.50 L/ha)** rate, one 19 L container treats 31.3 ac (12.7 ha)]
Water Volume:	Aircraft: Minimum 10-18 L/ac **(25-45 L/ha)** Ground Equipment: 18 L/ac **(45 L/ha)** total spray volume/ha
Incorporation:	Not applicable
Pressure:	300 kPa (minimum)
Ground Speed:	6.5 km/h
Nozzles:	Tee Jet 650067, 730067, 800067 Monarch 20 and 22, Spray Jet 65.067 When wind velocity is 15-30 km/h use TK.75 or D.75 nozzles spaced at 100 cm on the boom.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

   (a) Always make sure the sprayer is thoroughly cleaned before spraying Carbyne. This is especially important in preventing the carry-over of MCPA or 2,4-D into rapeseed and mustard fields.
   (b) Wild oat seedlings will produce a new leaf every five days (with good to average growing conditions). Therefore, they will reach the 2 leaf stage four to nine days after emergence.
   (c) Carbyne contains an optimum blend of surfactants and wetting agents. Therefore, additional wetting agents and surfactants are not required in the spray tank.
   (d) There are no restrictions on later application of other pesticides after the Carbyne treatment.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

(e) Carbyne should not be applied when plants are wet with dew or rain. Dew or rain 15 minutes after spray operations will not affect the activity of Carbyne.
(f) To achieve good wild oat control with Carbyne, it is essential that the wild oat plants receive good coverage from the spray application. The required coverage can be obtained by:
(g) Applying Carbyne in sufficient water to give 18 L/ac **(45 L/ha)** total spray volume.
(h) Operating the sprayer at 300 kPa to ensure a good break-up of the spray into fine droplets.
(i) Rotating the spray booms to direct the spray down and forward at a 45° angle.

9. HOW IT WORKS: Carbyne is a partially systemic herbicide (some translocation in plant), which penetrates the leaf and stem surfaces of the wild oat plant and interferes with cell division in the plant. Further development of the young seed head and new leaves is stopped shortly after the 2 leaf wild oat plant is treated. The first symptoms of Carbyne action are a stoppage of new growth, followed by a change in the color and texture of the plant. The plant becomes brittle, the leaf tips turn brown and the plant eventually dies.

10. EXPECTED RESULTS:

Wild Oats: An immediate stoppage of new growth, with the existing leaves gradually turning a blue-green color 7-10 days after application. At the same time, a swelling of the stem at ground level may also be noted. The leaf tips will turn brown, the plant becomes brittle and eventually dies 3-4 weeks after treatment. The time required for these symptoms to appear and for the wild oat plant to die is affected by crop stand, growing conditions and soil fertility.

Conditions under which poor results may be expected:
1. Rain within 15 minutes of application.
2. Too low an application rate of Carbyne for existing conditions.
3. Inadequate spray coverage of the wild oat plant due to lower than recommended sprayer pressure, incorrect spray nozzles or improper sprayer calibration.
4. Improper timing of Carbyne application relative to the growth stage of the wild oat plants. Only the wild oat plants in the 2 leaf stage will be controlled.

11. EFFECTS OF RAINFALL: Rainfall within 15 minutes of application may decrease control.

12. MOVEMENT IN THE SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: The hazard from drift is low, only common oats, buckwheat and rye can be seriously affected by drift.
Grazing Restrictions: Do not graze or feed crop for 5 weeks after treatment.
Crop Use After Hail: Do not use crop for 5 weeks after treatment.
Succeeding Crops: No restrictions.

14. TOXICITY:

- has very low acute toxicity to mammals
  - oral LD_{50} rats = 1,350 mg/kg (active ingredient)
  - oral LD_{50} rats = 2,750 mg/kg (formulation)
- has very low dermal toxicity
  - dermal LD_{50} rats = 2,300 mg/kg (active)
  - dermal LD_{50} rats = 3,360 mg/kg (formulation)
- short-term poisonings have not been observed
- **long-term exposure to this product has sensitized some people to it**
- very toxic to fish

15. PRECAUTIONS AND FIRST AID: Avoid as much exposure to Carbyne as possible.

- If on skin, wash off with soap and water.
- If in eyes, flush for 15 minutes with clean water and get medical attention.
- If Carbyne is swallowed, **do not induce vomiting**. Get medical attention.
- Take the labelled container to doctor.

16. STORAGE: At −40°C Carbyne thickens but does not freeze. The viscosity will return to normal as the temperature is increased. The good cold weather properties allow Carbyne to be stored in unheated storage.

17. WHERE AVAILABLE: Alberta Wheat Pool, Federated Co-operatives, Green Cross Product Dealers, Oliver Agricultural Supply, Pioneer Grain and United Grain Growers.

Additional information available from:

Velsicol Incorporated of Canada
1360 Blundell Road
Mississauga, Ontario
L4Y 1M5
Phone: (416) 270-5112

CASORON (dichlobenil)

1. FORMULATIONS: Granular 4% (25 kg bags)

2. REGISTERED MIXES: None

3. CROPS: Raspberries, Caragana shelterbelts, established woody ornamentals in nurseries as follows:

Arbor vitae
Ash
Barberry
Crabapple
Cutleaf weeping birch
Eastern red cedar
Euonymous
Honeysuckle
Juniper
Linden
Maple
Mock Orange
White cedar
Willow
Yew *(Taxus)*

Do not use on firs, Ajuga, lilac, spruce, mugho pine nor on herbaceous perennials.

4. WEEDS CONTROLLED:

Annual bluegrass
Chickweed
Foxtail
Groundsel
Horsetail
Knotweed
Lamb's-quarters
Purslane
Pigweed
Shepherd's-Purse
Smartweed
Spurge
Mustard

5. WEEDS SUPPRESSED: None

6. WHEN USED: Apply to shelterbelts, woody ornamentals and raspberries established for at least one growing season.

7. HOW TO APPLY:

With:	Ground equipment with suitable granular applications.
Rate:	44.5-70.8 kg/ac **(110-175 kg/ha)** based on the area actually treated. Do not use on light soil. Apply in late fall (after October 15) but before soil freeze-up.
Incorporation:	Not applicable
Ground Speed:	Not restricted
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a respirator when opening bags of granules.

8. SPRAYING TIPS:

9. HOW IT WORKS: Melting snow in spring incorporates the herbicide into the soil. Dichlobenil is an inhibitor of germination and of actively dividing meristems. It acts primarily on growing points and root tips.

10. EXPECTED RESULTS: Both monocotyledons and dicotyledons are controlled by inhibition of germinating seeds and growth of young seedlings plants.

The growth of emerging shoots of some perennial weeds is suppressed, e.g. quack grass.

Established shelterbelts or nursery crops tolerate treatment well since roots do not come into contact with dichlobenil that is located in the upper layers of the soil.

11. EFFECTS OF RAINFALL: If amounts of snowfall or rain are low, poor results can be expected.

12. MOVEMENT IN SOIL: Danger of movement in coarse-textured soils.

13. GRAZING AND CROPPING RESTRICTIONS: Do not transplant into treated soil for one year.

14. TOXICITY:

- has very low mammalian toxicity
  oral LD_{50} rats = 3160 mg/kg
- no short-term or long-term health problems have been associated with this product
- slightly toxic to fish

15. PRECAUTIONS AND FIRST AID:

- Avoid breathing dust from the granules.
- Avoid skin or eye contact.
- If on skin, wash off with soap and water.
- If in eyes, flush with plenty of water for 15 minutes and get medical attention.

16. STORAGE: Keep in dry storage. Frost does not affect Casoron.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE: Pfizer.

Additional information available from:

Pfizer C. & G. Inc.
1 Wilton Grove Road
London, Ontario
N6A 4C6

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

CO-OP DALAPON GRASS KILLER (dalapon)

1. FORMULATIONS: Free flowing wettable powder.
   Dalapon.. 74% active.
   Available in 2, 10 and 25 kg bags.

2. REGISTERED MIXES: Co-op Dalapon + 2,4-D ester
   Co-op Dalapon + MCPA amine

   Mixing restrictions: Have spray tank at least half full of water. Add Co-op Dalapon slowly, stirring to dissolve it completely. Then add the broad-leaf weed killer.

   Mixing with other pesticides: Not recommended

3. CROPS: Fallowland, flax, rapeseed, bird's-foot trefoil, alfalfa, new legume spring seedings, peas (field, processing), sugar beets.

   Underseeding: Using a combination of the above crops.

4. WEEDS CONTROLLED: Barnyard grass, blue grass, green foxtail (seedling), quackgrass, reeds, cattails.

5. WEEDS SUPPRESSED: None

6. WHEN USED:

   Pre-plant Treatments:
   1. Pasture renovation – for late fall application follow Co-op Dalapon with cultivation and seed the following spring. After summer application cultivate 4 to 10 days after treatment and wait two weeks before seeding legumes.
   2. Fall treatment for quackgrass on land to be planted to alfalfa, the following spring. Plough or cultivate 4 to 10 days after treatment.
   3. Spring treatment for quackgrass control: land to be cropped in the year of treatment. Wait 4 or 5 weeks before seeding crops such as alfalfa. Wait 4 to 10 days and plough down or cultivate.
   4. Spring treatment on fallow land – apply when quackgrass is growing actively. Plough or cultivate 4 to 10 days. Retreat regrowth.

   Grass Control in Crops:
   1. Flax and rapeseed – apply when crops are from the seedling to 15 cm tall and grass is from the seedling to 3 leaf stage.
   2. Bird's-foot trefoil and alfalfa (seed only) – apply in the fall when regrowth following cutting is 15 cm tall. Spring treatment should be made before active growth begins.
   3. New legume spring seedlings – apply 4 weeks after seeding (bird's-foot trefoil or alfalfa) when grass seedlings are small and legumes are 5-8 cm tall (3-4 leaf stage).
   4. Peas – apply 25 days prior to harvest when grass seedlings are young and peas are 5-15 cm tall.
   5. Sugar Beets – when beets are in 2-4 leaf stage and grass in seedling to 3 leaf stage.

7. HOW TO APPLY:

   With: Aircraft (pre-plant and non-cropland treatments only) or ground equipment.

   Rate: **Pre-Plant Treatments:**
   1. Pasture renovation: Use 2.23 kg/ac **(5.5 kg/ha)** of Co-op Dalapon.
   2. Fall treatment for quackgrass control: Use 6.7 kg/ac **(16.5 kg/ha)** of Co-op Dalapon.
   3. Spring treatment for quackgrass control: Land to be cropped in the year of treatment: use 3.6 kg/ac **(9 kg/ha)** of Co-op Dalapon.
   4. Spring treatment on fallow land: Use 4.45 kg/ac **(11 kg/ha)** of Co-op Dalapon. [At 11 kg/ha rate, one bag will do 5.7 ac **(2.3 ha)**]

   Grass Control in Crops:
   1. Flax and rapeseed: Use 0.34-0.45 kg/ac **(0.85-1.1 kg/ha)** of Co-op Dalapon.
   2. Bird's-foot trefoil and alfalfa (for seed only): In established stands of bird's-foot trefoil use 1.32 kg/ac **(3.25 kg/ha)** of Co-op Dalapon. In established stands of alfalfa use 2.22 kg/ac **(5.5 kg/ha)** of Co-op Dalapon.
   3. New legume spring seedlings: Use 0.89-1.32 kg/ac **(2.2-3.25 kg/ha)** of Co-op Dalapon.
   4. Peas: Use 0.45 kg/ac **(1.1 kg/ha)** of Co-op Dalapon. [At 0.45 kg/ac **(1.1 kg/ha)** rate, one bag will do 56 ac (22.7 ha)].
   5. Sugar Beets: Up to 1.82 kg/ac **(4.5 kg/ha)** of Co-op Dalapon (overall application). Band treatments may be used.

   Water Volume: Ground: Use minimum of 40 L/ac **(100 L of water/ha)**

   Incorporation: Not applicable.

   Pressure: 275 kPa

   Ground Speed: 9 km/h

   Nozzles: All standard and low pressure nozzles, delivering 40 L/ac **(100 L/ha)** or more.

   Protective Equipment: Standard protective clothing when applying herbicides.
   – plus a respirator and goggles when opening Dalapon bags.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

8. SPRAYING TIPS: In tank mixes with broad-leaf herbicides do not use more than 3.6 kg/ac **(9 kg/ha)** of Dalapon. Do not apply in the same summer and fall. Spray thoroughly and uniformly.

9. HOW IT WORKS: Absorbed by both roots and leaves and is easily washed off foliage. Translocates readily throughout the plant and accumulates in young tissue. It affects cell membrane permeability.

10. EXPECTED RESULTS: Several weeks may be required for maximum effect on top growth in heavy stands. Because of limited persistence in the soil, new seedling grasses may invade treated area. Re-treat or cultivate. If grass is not growing well, i.e. overly mature or suffering from drought or cold weather, results may be poor.

11. EFFECTS OF RAINFALL: Under dry conditions decomposition may be slower, and more time will be required after ploughing before certain crops can be planted. Rain shortly after application can wash the herbicide off the leaves.

12. MOVEMENT IN SOIL: Not a problem under normal use conditions.

13. GRAZING AND CROPPING RESTRICTIONS: Do not allow dairy or meat animals to graze on treated vegetation during the year of application. Do not graze or feed cuttings of bird's-foot trefoil and alfalfa, the year of treatment, to dairy animals or animals being finished for slaughter. Do not feed treated pea vines, pea silage or pea vine hay to livestock. On land to be planted to sensitive crops, including grasses, delay planting for at least 30 days after ploughing or deep cultivation, following application.

14. TOXICITY:

    - has very low acute mammalian toxicity
      oral LD_{50} rats = 9,300 mg/kg
    - no short-term or long-term human health problems have been associated with Dowpon M when used according to label
    - non-toxic to fish and birds
    - moderate skin irritant on repeated prolonged contact

15. PRECAUTIONS AND FIRST AID: This product may cause a mild burn if it is kept in contact with the skin. Therefore, wash skin immediately with plenty of water. This product can cause eye irritation. Avoid inhaling dust which may be irritating to the throat and air passages.
    - If in eyes, flush with plenty of water for 15 minutes. Get medical attention.

16. STORAGE: Store away from food and feed stuffs.

17. WHERE AVAILABLE: Co-op Farm Supply Centres.

Additional information available from:

Interprovincial Co-op Ltd.
Box 1050
Saskatoon, Saskatchewan
S7K 3M9
Phone: (306) 244-3208

CO-OP GRANULAR SOIL STERILANT

1. FORMULATIONS: Dry granule.
   Contains – Sodium Metaborate Tetrahydrate 66.5%, Sodium Chlorate 30.0% and Diuron 1.25 %.
   Available in 1 kg, 4 kg and 22.7 kg containers.

2. REGISTERED MIXES: None

3. CROPS: Use only on non-crop land where long term control of all vegetation is desired such as fence lines, storage yards, around farm buildings, etc.

4. WEEDS CONTROLLED: All annual and perennial grass and broadleaf plants are susceptible to CO-OP Granular Soil Sterilant.

5. WEEDS SUPPRESSED:

6. WHEN USED: Use in early spring when weeds are small or in fall when weed growth is dormant.

7. HOW TO APPLY:

With: Shake can, mechanical spreader or backyard sprayer.

Rate: Annual weeds use 1/2-1 kg per 10 m^2. For quick knockdown of vegetation and residual control of broadleaf weeds and grasses. Apply in dry form or a spray; uniform application is essential. Both spray and dry applications become effective as soil treatments following rainfall or irrigation.

Dry application – apply with a shaker can or mechanical spreader. Use the lower rate only at time of weed emergence on moist soil or when rainfall is expected while weeds are still young. Thoroughly water the treated area after application.

Spray application – apply as a contact spray when young growth is up to 15 cm high. Thoroughly wet all plant parts, particularly the growing tips. Use the higher rates to ensure thorough coverage of heavy vegetation or to provide extended residual control. Use sufficient water for good coverage. 5 L per 10 m^2 is usually sufficient.

Persistent perennial weeds – 1-2 kg per 10 m^2. Apply in dry form or as a spray using sufficient water to provide for uniform coverage. Treat when weeds are nearing maturity or during dormant stages in the fall. Spring applications may also be made under moderate rainfall conditions. Summer applications are recommended only where rainfall is dependable for leaching the herbicide into the soil. On deep-rooted perennials such as bindweed, Canada thistle and quack grass, the heavier rates may be required.

Water Volume: Not applicable.
Incorporation: Not applicable.
Pressure: Not applicable.
Ground Speed: Not applicable.
Nozzles: Not applicable.
Protective Equipment: Standard protective clothing used when applying herbicides.

8. SPRAYING TIPS:

Limitations (a) Avoid application in hot, dry weather.
(b) To avoid possible fire hazard due to dead and dry vegetation, treat when weeds are small not over 15 cm high. If growth is well advanced, mow and rake before treatment. Do not apply on or near lawns, trees, shrubs, crops and other desirable plants or on areas into which their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots. Do not drain or flush equipment in such areas. Do not contaminate any body of water.

9. HOW IT WORKS: CO-OP Granular Soil Sterilant controls existing vegetation through contact action. The chemical persists in the soil and provides prolonged control of germinating seedlings and re-growth from perennial roots. Length of control will vary with:

   (a) Weed species present.
   (b) Rate applied.
   (c) Soil type.
   (d) Amount of rainfall.
   (e) Amount of vegetation cover at time of application.
   (f) Season of application. To provide prolonged control, rainfall or irrigation is required to wash the chemical into the soil.

10. EXPECTED RESULTS: Seedlings will be controlled quickly. Perennial weeds will be controlled more slowly. Length of control will vary (see 9 above).

11. EFFECTS OF RAINFALL: Rainfall will move the product into the soil and enhance its activity, especially on perennial weeds. In areas of high rainfall, the residual effect of the product will be reduced, especially on sandy soils.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

12. MOVEMENT IN SOIL: Limited.

13. GRAZING AND CROPPING RESTRICTIONS: Treated area will be rendered totally or partially unproductive for one or more years. Use only where unproductive soil is not objectionable. Keep animals off treated areas until treated areas are well watered and completely dry or until rainfall has leached the herbicide into the soil as grazing reduces the effect of the treatment and salt hungry animals may eat poisonous weeds.

14. TOXICITY:

Has very low acute mamalian toxicity
- Oral LD_{50} 2330-3500 mg/kg (rats)

15. PRECAUTIONS AND FIRST AID: Keep out of reach of children. Harmful if swallowed. May cause irritation of eyes, nose, throat and skin. Avoid breathing dust or spray mist. Avoid contact with skin, eyes and clothing. Avoid handling with cuts and abrasions on hands and wear gloves. Do not smoke or strike matches while applying. Wash clothing after application.

- Avoid skin or eye contact.
- If on skin, wash off with large quantities soap and water.
- If in eyes, flush with plenty of water for 15 minutes and get medical attention.
- If ingested, dilute by drinking soapy water to induce vomiting. Get medical attention.

16. STORAGE: Avoid contamination of foods, feed, fertilizers and seed.
Keep pesticide in original containers. Store in cool, dry place. Do not store with foodstuffs. Avoid direct contact with ground or concrete floors when storing.

17. WHERE AVAILABLE: Co-op Farm Supply Centres.

Additional information available from:

Federated Co-operative Limited
Box 1050
Saskatoon, Saskatchewan
S7K 3M9
Phone: (306) 244-3208

2,4-D

1. FORMULATIONS:

	g active/L
2,4-D ester	800
2,4-D low volatile ester	500, 600, 700
2,4-D amine	500

Available in 20 L containers.

2. REGISTERED MIXES:

2,4-D + atrazine and related triazines
2,4-D + bromoxynil
2,4-D + dalapon
2,4-D + dicamba
2,4-D + picloram (Tordon)
2,4-D + sodium TCA (NaTA)
2,4-D + ester + difenzoquat (Avenge 200C)
2,4-D + Stampede 360 (wheat and durum)

3. CROPS: Wheat (spring and winter), barley, rye, oats, corn, flax (linseed), established seed grasses, grass pasture and turf, asparagus.

Note: See product label and chart in this write-up for restrictions on some crops and weeds controlled.

Underseeding: Not recommended

4. WEEDS CONTROLLED:

Annual sunflower
Bluebur
Burdock
Cocklebur
Flixweed
Goat's-beard
Kochia
Lamb's-quarters
Mustard
(except dog and green tansy)
Peppergrass (common)
Pigweed (prostrate, Russian)
Plantain
Prickly lettuce
Purslane
Ragweeds
Shepherd's-purse
Sow-thistle (annual)
Stinkweed
Sweet clover
Vetch
Wild radish

Hard to Kill Weeds:
Bindweed (hedge)
Dandelion
Docks
Gumweed
Hairy galinsoga
Mustard (dog)
Oak-leaved goosefoot

Top Growth Control:
Bindweed (field)
Blue lettuce
Canada thistle
Field horsetail
Leafy spurge
Pigweed (redroot)
Sow-thistle (perennial)

5. WEEDS SUPPRESSED: Field peppergrass, biennial wormwood, pineapple weed, Russian thistle.

6. WHEN USED:

Wheat, Barley, Rye: From the 3 leaf expanded stage to just before the flag leaf (shot blade) stage.
Oats: From emergence to the 3 leaf stage or from the 6 leaf to just before the flag leaf. Oats are more sensitive to 2,4-D (especially the ester) than wheat or barley and generally the use of 2,4-D is not recommended on oats.
Flax (linseed-Amine only): Treat after the plants reach 5 cm in height and before the bud stage.
Corn (Amine only): At emergence – between first emergence and when the corn plants are 15 cm tall.
Post-emergence – when plants are 15-20 cm tall and weeds have germinated but are still in the seedling stage. Use drop nozzles to keep spray off foilage of corn.
Grass pasture and turf: Apply to susceptible weeds when they are in the seedling stage.
Asparagus (Amine only): Treat following a cultivation just before first spears appear. Treatment may be repeated at end of cutting season.

7. HOW TO APPLY:

With: Aircraft or ground equipment
Rate: All rates are in L/ac **and (L/ha)**
* Note: Higher rates indicated, may be used if crop is heavily infested with susceptible weeds, but some crop injury may occur.

FORMULATION AND CONCENTRATION

	RATE				
Crop	**Amine 500** L/ac **(L/ha)**	**Ester 500** L/ac **(L/ha)**	**Ester 600** L/ac **(L/ha)**	**Ester 700** L/ac **(L/ha)**	**Ester 800** L/ac **(L/ha)**
Wheat,	0.28-0.45 **(0.70-1.1)**	0.28-0.71 **(0.70-1.75)**	0.24-0.61 **(0.60-1.5)**	0.16-0.51 **(0.47-1.25)**	0.16-0.46 **(0.40-1.14)**
barley, rye *	0.51-0.73 ***(1.25-1.8)**				
Flax	0.28-0.45 **(0.70-1.1)**	Not Recommended			
Oats	0.28-0.45 **(0.70-1.1)**	Not Recommended			
Corn (at emergence)	0.61 **(1.5)**	Not Recommended			
post-emergence	0.22-0.45 **(0.55-1.1)**	Not Recommended			
Established grasses	0.45-0.81 **(1.1-2.0)**	0.61-0.71 **(1.5-1.75)**	0.34-0.61 **(0.85-1.5)**	— —	0.24-0.45 **(0.60-1.1)**
Grass pasture & turf	0.61-1.72 **(1.5-4.25)**	0.81-1.42 **(2.0-3.5)**	0.61-1.11 **(1.5-2.75)**	0.61-1.01 **(1.5-2.5)**	0.61-0.81 **(1.5-2.0)**
Asparagus	1.42 **(3.5)**	Not Recommended			

For registered mixes of 2,4-D Ester 500 with Avenge 200C – use up to 0.45 L/ac **(1.12 L/ha)** of 2,4-D Ester 500 with 1.42-1.7 L/ac **(3.5-4.2 L/ha)** of Avenge 200C.

For tank mix with Stampede 360 for use on wheat and durum only use 1.1 L/ac **(2.75 L/ha)** Stampede 360 + 0.32-0.49 L/ac **(0.8-1.2 L/ha)** ester 500 or equivalent *OR* 1.1 L/ac **(2.75 L/ha)** Stampede 360 + 0.49 L/ac **(1 2 L/ha)** amine 500.

Water Volume: Aircraft: minimum 8 L/ac **(20 L/ha)** of water
Ground: Wheat, barley, rye, oats – 40 L/ac **(100 L/ha)** of water
Flax (linseed) – minimum 40 L/ac **(100 L/ha)** of water
Corn – 40 L/ac **(100 L/ha)** of water
Grass Pastures and Turf – Use enough water for thorough coverage 160 L/ac **(400 L/ha)** of water

Incorporation: Not applicable
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: Standard nozzles delivering a minimum of 40 L/ac **(100 L/ha)**
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS: Apply in the amount of water required for even distribution. Spray during warm weather when the weeds are young and growing actively. At high temperatures vapourization of more volatile esters may cause injury to susceptible plants growing nearby.

9. HOW IT WORKS: Plant roots absorb salt forms of 2,4-D most readily. Leaves absorb ester more readily. 2,4-D translocates in the phloem moving with the food or in the transpiration stream. It is a hormone type herbicide causing an abnormal growth response, and affects respiration, food reserves and cell division.

10. EXPECTED RESULTS: Susceptible plants become malformed before they die.

11. EFFECTS OF RAINFALL: A rain free period of 4 to 6 hours is usually sufficient for effective weed control.

12. MOVEMENT IN SOIL: Under normal use conditions leaching does not pose a problem.

13. GRAZING AND CROPPING RESTRICTIONS: Do not use on turf of creeping grasses such as bent or on freshly seeded turf until grass is well established. Do not allow spray drift to contact vegetables, flowers, grapes, fruit trees, ornamentals or other desirable plants which are sensitive to 2,4-D.

    Succeeding Crops: No restrictions

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

14. TOXICITY:

- has high acute toxicity to mammals
  oral LD_{50} rats = 100-300 mg/kg for various formulations
- no short-term or long-term human health problems have been associated with 2,4-D
- no dioxin is present in these formulations
- some formulations may cause skin irritation
- inhalation toxicity of 2,4-D is considered to be minimal
- some formulations can be toxic to fish and should not be introduced into aquatic environments unless specifically recommended on the label

15. PRECAUTIONS AND FIRST AID: If 2,4-D is taken in by mouth, the person may become nauseated or vomit. He may sweat profusely, and may feel a burning sensation in his mouth and chest. He may also have aching muscles. 2,4-D may cause eye and skin irritation. Avoid contact with skin and eyes and do not breathe in spray mist.

- If on skin, wash with soap and water.
- If in eyes, flush for 15 minutes with clean water and get medical attention.
- If amine formulation is swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- If the ester formulation is swallowed, **do not induce vomiting.** Get medical attention immediately.
- Always take labelled container of product you are using to the doctor.

16. STORAGE: If amines are exposed to temperatures below 0° they should be warmed to 4°C and mixed thoroughly before using. Store away from fertilizers, feeds, foodstuffs, seeds, insecticides or fungicides.

17. WHERE AVAILABLE: Oliver Agricultural Supply, Cargill Grains, Pfizer Chemical Dealers, United Grain Growers, Alberta Wheat Pool, Federated Co-operatives, United Farmers of Alberta, Green Cross Product Dealers.

Additional information available from:

Uniroyal Chemical
4, 1323 – 44 Avenue N.E.
Calgary, Alberta
T2E 6L5
Phone: (403) 276-9481

Dow Chemical Canada Inc.
Suite 2412, 10025 Jasper Avenue
Edmonton, Alberta
T5V 1S6
Phone: Toll Free 1-800-661-6436

Or manufacturer of brand purchased.

DESORMONE 7 (2,4-D + dichlorprop)

1. FORMULATIONS: Emulsifiable concentrate: 2,4-D 350 g/L, dichlorprop 350 g/L.
   Available in 20 L containers.

2. REGISTERED MIXES: Not recommended.

   Mixing Restrictions: Not applicable.

3. CROPS: Industrial areas, roadsides, utility right-of-ways.

   Underseeding: Not applicable.

4. WEEDS CONTROLLED: Alder, aspen, birch, buckbrush, elderberry, hazel, honeysuckle, poplar, sumac, wild cherry, willow.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Any time of the growing season.

7. HOW TO APPLY:

   With: Power equipment, low volume knapsack sprayer, aircraft.
   Rate: 10 L in 1,000 L of water for foliage stem method. See product label for alternate rates and methods.
   Water Volume: Use enough water or spray volume to ensure adequate coverage – With fixed-wing aircraft use 8 L/ac **(20 L/ha)** of spray solution
   Incorporation: Not applicable.
   Pressure: Use pressure that is recommended for equipment used.
   Ground Speed: Not applicable.
   Nozzles: No restrictions.
   Protective Equipment: Standard protective clothing when applying herbicides.
   – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

   (a) Add one half the required amount of water or oil to the spray tank, then add the herbicide with agitation, and finally, the balance of the water or oil with continued agitation.
   (b) If this material is to be used in straight oil mixture, do not let water get into the mixture.
   (c) This material forms an emulsion in water – not a solution. This tends to separate on standing. Provide agitation to prevent such separation and insure an uniform spray mixture.

9. HOW IT WORKS: Desormone is a translocated systemic post-emergence herbicide that is absorbed by the leaves of the plant. Investigation has shown that it causes abnormal growth response and affects respiration, food reserves and cell division.

10. EXPECTED RESULTS:

    Leaves will show wilting, and browning shortly after spraying. Leaves will not reappear the following year.

11. EFFECTS OF RAINFALL: Rainfall within 3 to 4 hours after application may reduce control.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Drift onto nearby susceptible crops may cause injury.
    Grazing Restrictions: None specified.

14. TOXICITY:

    - has low acute mammalian toxicity
      2,4-D: oral LD_{50} rats = 375 mg/kg
      dichlorprop: oral LD_{50} rats = 800 mg/kg
    - Desormone 7 has not caused any short-term or long-term health problems due to exposure when used according to label
    - the 2,4-D in this formulation contains no dioxin

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes and do not inhale fumes or spray mist.

    - If on skin, wash with soap and water.
    - If in eyes, flush with clean water for 15 minutes and get medical attention.
    - If swallowed, **do not induce vomiting** but rush patient to nearest hospital.
    - Take labelled container with you to doctor.

16. STORAGE: Do not store near fertilizers, seeds, insecticides or fungicides. If product was stored under freezing conditions warm to 5°C and mix well before using.

17. WHERE AVAILABLE: Allied Chemical Services.

Additional information available from:

Allied Chemical Services Ltd.
5507 – 1st Street S.E.
Calgary, Alberta
T2H 1H9
Phone: (403) 253-8471

DIPHENOPROP 700/SILVAPROP LV700 (2,4-D + dichlorprop)

1. FORMULATIONS: Emulsifiable concentrate: 2,4-D 350 g/L, dichlorprop 350 g/L.
   Available in 20 L containers.

2. REGISTERED MIXES: Not recommended

   Mixing Restrictions: Not applicable

3. CROPS: Industrial areas, roadsides, utility right-of-ways.

4. WEEDS CONTROLLED: Alder, aspen, birch, buckbrush, elderberry, hazel, honeysuckle, poplar, sumac, wild cherry, willow.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Any time of the growing season.

7. WHEN TO APPLY:

   With: Power Equipment, low volume knapsack sprayer, aircraft
   Rate: 8.5-11.25 L in 1,000 L of water for foliage stem method. See product label for alternate rates and methods.
   Water Volume: Use enough water or spray volume to ensure adequate coverage.
   Incorporation: Not applicable.
   Pressure: Use pressure that is recommended for equipment used.
   Ground Speed: Not applicable.
   Nozzles: No restrictions.
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

   (a) Add one half the required amount of water or oil to the spray tank, then add the herbicide with agitation, and finally, the balance of the water or oil with continued agitation.
   (b) If this material is to be used in straight oil mixture, do not let water get into the mixture.
   (c) This material forms an emulsion in water – not a solution. This tends to separate on standing. Provide agitation to prevent such separation and ensure a uniform spray mixture.

9. HOW IT WORKS: Diphenoprop 700 is a translocated systemic post-emergence herbicide that is absorbed by the leaves of the plant. Investigation has shown that it causes abnormal growth response and affects plant respiration, food reserves and cell division.

10. EXPECTED RESULTS: Leaves will show wilting and browning shortly after spraying. (Leaves will not reappear the following year.)

11. EFFECTS ON RAINFALL: Rainfall within 3 to 4 hours after application may reduce control.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Drift onto nearby susceptible crops may cause injury.
    Grazing Restrictions: None specified.

14. TOXICITY:
    - has low acute mammalian toxicity
      2,4-D: oral LD_{50} rats = 375 mg/kg
      dichlorprop: oral LD_{50} rats = 800 mg/kg
    - this product has not caused any short-term or long-term health problems due to exposure when used according to label
    - the 2,4-D in this formulation contains no dioxin.

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist.

    - If on skin, wash with soap and water.
    - If in eyes, flush with clean water for 15 minutes and get medical attention.
    - If swallowed, **do not induce vomiting because of petroleum distillates** in formulation. Rush patient to nearest hospital emergency.
    - Take labelled container to doctor.

16. STORAGE: Do not store near fertilizers, seeds, insecticides or fungicides. If product was stored under freezing conditions warm to 5°C and mix well before using.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE:

Additional information available from:

PFIZER C. & G. Inc.
2140 Notre Dame Avenue
Winnipeg, Manitoba
R3H OK1
Phone: (204) 632-5216

Niagara Chemical
Division of Reichhold Ltd.
1274 Plains Road East
Burlington, Ontario L7R 3Z1
Phone: (416) 634-2355

DUAL CIBA-GEIGY 960E (metolachlor)

1. FORMULATIONS: Emulsifiable concentrate containing 960 g/L metolachlor.
   Available in 10 L plastic jugs.

2. REGISTERED MIXES: Dual Ciba-Geigy may be applied as a split application or tank mix with the following herbicides:

   Note: See product label for additional information regarding mixture rates, application procedures, timing and other restrictions.

   CORN (Seed, grain, silage, sweet)
   Aatrex Liquid
   Aatrex Nine-O
   Aatrex 90W
   Aatrex 80W
   Bladex 80W
   Bladex Liquid
   Kil-Mor*
   Estemine 2,4-D*
   Banvel

   POTATOES
   Patoran 50W
   Patoran 670 Flowable
   Sencor 500 Flowable

   * Split application only.

   LIQUID NITROGEN: 28% nitrogen solutions or complete liquid fertilizers may replace all or part of the water as a carrier for pre-plant incorporated or pre-emergent application of Dual Ciba-Geigy 960E tank mixes in corn.
   DRY BULK GRANULAR FERTILIZERS: Consult the label for instructions.

3. CROPS: Corn, potatoes and common (white) beans

4. WEEDS CONTROLLED: Barnyard grass, foxtail (green and yellow).
   Plus annual broad-leaf weeds listed for other herbicide in mix or oversprayed.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Pre-plant incorporated.

7. HOW TO APPLY:

   With: Ground equipment as an overall spray or as a band treatment.
   Rate:
   POTATOES, WHITE BEANS – 0.81-1.11 L/ac **(2-2.75 L/ha)**
   CORN – TANK MIXTURES

Weeds Controlled	Timing	DUAL CIBA-GEIGY 960E Rate/ac **(Rate/ha)**	TANK MIXES Rate/ac **(Rate/ha)**
Annual grasses and	ppi*	0.89-1.11 L/ac **(2-2.75 L/ha)**	0.51-0.71 L/ac +**(1.25-1.75 kg/ha)** Aatrex Nine-O or 0.51-0.71 L/ac **(1.25-1.75 kg/ha)** Aatrex 90W or 0.91-1.32 L/ac **(2.25-3.25 L/ha)** Aatrex Liquid or 0.91-1.32 L/ac **(2.25-3.25 kg/ha)** Bladex 80W or 1.52-2.23 L/ac **(3.75-5.5 L/ha)** Bladex Liquid or 0.61-0.81 L/ac **(1.5-2.0 kg) Aatrex 80W**

Weeds Controlled	Timing	DUAL CIBA-GEIGY 960E Rate/ac (Rate/ha)	Rate/ac [Rate/ha of split applied product (post-emergence)]
Annual grasses and Broad-leaf weeds	ppi & post**	0.89-1.11 L/ac **(2-2.75 L/ha)**	+ 344-445 mL/ac +**(850-1.1 L/ha)** Kil-Mor or 283-445 ml/ac **(700-1.1 L/ha)** Estemine 2,4-D

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

* pre-plant incorporated
** post-emergence

At 0.81 L/ac **(2 L/ha)** Dual Ciba-Geigy 960E, one 20 L container will treat 24.6 ac **(10 ha).**

Water Volume: 20-40 L/ac **(50-100 L/ha)**

Incorporation: Incorporate to a depth of 5 cm. Do not exceed this depth of incorporation since dilution of the product can occur. If using tandem discs set to cut to a depth of 10 cm operated at 6 to 9 km/h. If using "S tine" (Danish) cultivators with tines on 15-20 cm centres, set 10 cm deep and operate at 9-13 km/h. Spike tooth or diamond tooth harrows are not considered preferred incorporation equipment and if used, incorporation must be done in two directions at right angles to each other. Immediate incorporation is not necessary although desirable.

Pressure: 275 kPa

Ground Speed: 9 km/h

Nozzles: All standard and low pressure nozzles delivering approximately 20-40 L/ac **(50-100 L/ha)**

Protective Equipment: Standard protective clothing when applying herbicides.
- plus a face shield and apron when opening pails of Dual Ciba-Geigy.

8. SPRAYING TIPS: Avoid drift onto nearby crops, gardens, etc.
   Do not tank mix with Kil-Mor or Estemine.

9. HOW IT WORKS: Metolachlor is a germination inhibitor, active mainly on grasses.

10. EXPECTED RESULTS: High percentage of control on annual grasses expressed by lack of germination or die back soon after the seedling emerges. This "post-kill" situation is more common under fairly dry conditions and can be variable since metolachlor requires moisture to perform at its best.

11. EFFECTS OF RAINFALL: If rainfall is excessive, the product may be moved below the layer of germinating grasses.

12. MOVEMENT IN SOIL: Some movement is possible if sufficient moisture is present. Leaching can occur in sandy soils.

13. CROPPING AND GRAZING RESTRICTIONS:
    Do not use Dual Ciba-Geigy 960E on muck, peat or high organic soils.
    Do not apply Dual Ciba-Geigy 960E once crop emergence has begun.
    Winter cereals may be planted 4 months following application of Dual Ciba-Geigy.

14. TOXICITY:
    - has very low acute toxicity to mammals
      oral LD_{50} rats = 2,780 mg/kg
      dermal LD_{50} rats = 3,170 mg/kg
    - no short-term poisoning may occur from exposure to Dual Ciba-Geigy 960E
    - **prolonged exposure may cause eye damage**
    - slightly toxic to fish; non-toxic to birds
    - low inhalation toxicity (LC_{50} rats = 1,750 mg/m^3)

15. PRECAUTIONS AND FIRST AID: Prevent excessive and prolonged eye exposure to Dual Ciba-Geigy.
    - If in eyes, wash thoroughly with plenty of water for 15 minutes and get medical attention immediately.
    - Avoid skin contact. If on skin, wash with soap and water.
    - **Dual Ciba-Geigy may cause skin sensitization in some people.**
    - Use all precautions to prevent over-exposure.
    - If swallowed, **do not induce vomiting, because of petroleum distillates**. Get medical attention.
    - Take labelled container to doctor.

16. STORAGE: No special temperature required.

17. WHERE AVAILABLE: Green Cross Product Dealers.

Additional information available from:

Green Cross Products
820 – 26 Street N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

DYANAP

1. FORMULATIONS: Water soluble solution – naptalam 220 g/L
   dinoseb 110 g/L.

2. REGISTERED MIXES: None.

3. CROP: Cucumbers.

4. WEEDS CONTROLLED: Lamb's-quarters, pigweed, ragweed, purslane, mustard, barnyard grass, crabgrass, foxtail.

5. WEEDS SUPPRESSED:

6. WHEN USED: Dyanap is a pre-emergence herbicide that can be applied at planting time or after the planting operation. The chemical must be applied before the crop emerges.

7. HOW TO APPLY:

With:	Ground equipment.
Broadcast Rate:	Use 5.67 L/ac **(14 L/ha)** on light soils or 6.9 L/ac **(17 L/ha)** on heavy soils.
Water Volume:	80-160 L/ac **(200-400 L/ha)**.
Pressure:	275 kPa
Ground Speed:	
Nozzles:	All standard nozzles delivering 80-160 L/ac **(200-400 L/ha)**.
Protective Equipment:	Standard protective clothing when applying herbicides.
Banding Rate:	On light soils use the following formula to calculate the rate of Dyanap required per hectare:

$$\text{Litres of Dyanap} = \frac{\text{Band width (cm)}}{\text{Row width (cm)}} \times 14$$

On heavy soils, use the following formulation to calculate the rate of Dyanap required per hectare:

$$\text{Litres of Dyanap} = \frac{\text{Band width (cm)}}{\text{Row width (cm)}} \times 17$$

To calculate L/ac – divide by 2.471

8. SPRAYING TIPS: Application should be made on fields that are as free as possible from stubble and litter. If soil is cold at time of seeding, Dyanap application should be delayed until soil temperature warms up. Do not apply after crop has emerged.

9. HOW IT WORKS: Dinoseb destroys the cell membranes of treated tissue, resulting in loss of cellular contents by leakage with subsequent dessication of the plant. Naptalam inhibits growth in the meristem areas and causes stunted, malformed weed seedlings.

10. EXPECTED RESULTS: Under conditions of rapid activity (20°-25°C), there is a loss of membrane integrity which results in rapid browning and the eventual desiccation of the plant. Residual activity, which lasts approximately 6 to 8 weeks, will control susceptible germinating seedlings.

11. EFFECTS OF RAINFALL: A heavy rain greater than 1.25 cm after application of Dyanap and during germination period for cucumber seed could cause crop damage on sandy loam and fine silt loam soils.

12. MOVEMENT IN SOIL: Leaches rapidly in highly porous or silt loam soils of extremely fine texture.

13. CROPPING AND GRAZING RESTRICTIONS: None.

14. TOXICITY:

Naptalam:
- has very low acute mammalian toxicity
  oral LD_{50} rats = 8,200 mg/kg
- non-irritating to skin and eyes
- non-toxic to fish and wildlife

Dinoseb:
- very toxic to mammals and humans
- oral LD_{50} rats = 58 mg/kg
- may cause slight kidney and liver problems with continous long term exposure without protective equipment
- a skin irritant and rapidly absorbed through the skin
- an eye irritant
- inhalation of fumes and spray mist may be irritating
- very toxic to fish and birds

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

15. PRECAUTIONS AND FIRST AID: Dyanap is a very toxic product and care should be used when handling it. Do not get into eyes (wear goggles), on skin, or on clothing. Avoid breathing spray mist; wear a respirator when handling concentrated material. Do not wear contaminated clothing.

Symptoms of Poisoning: Excessive fatigue, sweating, thirst and fever. If symptoms of poisoning develop from any exposure to Dyanap – GET TO A PHYSICIAN IMMEDIATELY. If feverish, cool with cold compresses or by immersion in cool water.

- If swallowed, induce vomiting by giving one tablespoon syrup of ipecac, and get person to the emergency of your nearest hospital.
- If in eyes, wash thoroughly with plenty of water for 15 minutes and get medical attention immediately.
- Avoid skin contact. If on skin, immediately remove contaminated clothing, wash with soapy water followed by rinsing with clean water. If symptoms of poisoning develop, take person to emergency of the nearest hopital.
- Take labelled container to doctor.

Note to Physician: Active ingredient is a metabolic stimulant. Treat symptomatically.

16. STORAGE: Store above 0°C. Store in a dry location. Shake well before using.

17. WHERE AVAILABLE:

Additional information available from:

Zaychuk Nursery
Vegetable & Berry Farms Ltd.
R.R. #6
Edmonton, Alberta
T5B 4K3
Phone: (403) 973-6440

Niagara Chemical
1274 Plains Road East
P.O. Box 5004
Burlington, Ontario
L7S 3Z1
Phone: (416) 634-2355

DYCLEER (dicamba)

1. FORMULATIONS: DyCleer – 400 g dicamba DMA/L
DyCleer 2:4 – 200 g dicamba DMA/L
400 g 2,4-D amine/L
DyCleer 10P – 10% dicamba pellets

2. REGISTERED MIXES: DyCleer + 2,4-D amine
DyCleer + 2,4-D L.V. ester
DyCleer + 2,4-D L.V. ester + 2,4-DP ester

Mixing with other pesticides: Not recommended.

3. REGISTERED USES: Non-cropland use for control of broad-leaf weeds and brush.

4. BRUSH, WEEDS CONTROLLED: Deciduous and coniferous brush species and hard to kill annual and perennial weed species.

6. WHEN USED:

DyCleer and DyCleer 2:4 – Deciduous species – when leaves are fully expanded in June. Coniferous species – apply in June. Broad-leaf weeds – when actively growing, normally between May and July.
DyCleer 10P: Deciduous and coniferous species – spring or early summer when rainfall expected.

7. HOW TO APPLY:

With: DyCleer and DyCleer 2:4: With conventional boom sprayer, a handgun or boomless type sprayer. Thorough coverage essential. DyCleer 10P: With hand or mechanical applicator.

Rate: Snowberry, wolfwillow, aspen, alder, wild rose, cherry: 2.5 L DyCleer plus 2 kg a.i. of 2,4-D amine or L.V. ester in 1,000 L water, or 5 L DyCleer 2:4 in 1000 L water.

Balsam poplar, basswood, birch, elm, hickory, vine maple, black cottonwood, bur oak, red oak: 5.0 L DyCleer plus 4 kg a.i. of 2,4-D amine or L.V. ester in 1,000 L water or 10 L DyCleer 2:4 in 1,000 L water.

White ash, spruce, pine, balsam fir, tamarack, white cedar: 6.25 L DyCleer plus 2.5 kg a.i. of 2,4-D L.V. ester plus 2.5 kg a.i. of 2,4-DP ester in 1000 L water, or 10 L DyCleer 2:4 in 1,000 L water. DyCleer 2:4 is weak on white ash.

Poison ivy: 0.81 L DyCleer + 0.45 kg a.i. of 2,4-D amine/ac **(2.0 L DyCleer + 1.1 kg a.i. of 2,4-D amine/ha)** or 1.72 L DyCleer 2:4/ac **(4.25 L DyCleer 2:4/ha)**.

Top growth of absinth, Canada thistle, perennial sow-thistle, leafy spurge, poverty weed, scentless chamomile: 0.61 L/ac **(1.5 L/ha DyCleer or 0.61 L DyCleer + 0.45 kg a.i. LV ester/ac (1.5 L DyCleer plus 1.1 kg a.i. of 2,4-D amine or L.V. ester/ha)** for additional broad-leaf control or 1.11 L/ac **(2.75 L/ha)** DyCleer 2:4.

Perennial sow-thistle, ragweed, English daisy, goldenrod, tansy ragwort, Canada thistle, field bindweed, and top growth of curled dock: 1.11 L/ac **(2.75 L/ha)** DyCleer or 1.1 L of DyCleer + 0.45 kg a.i. 2,4-D amine **(2.75 L DyCleer plus 1.1 kg a.i. of 2,4-D amine or L.V. ester/ha)** for additional broad-leaf control or 2.23 L/ac **(5.5 L/ha)** DyCleer 2:4.

Diffuse knapweed, goat's-beard, ground cherry, pasture sage, poverty weed, sheep sorrel, thyme-leafed spurge: 2.23 L/ac **(5.5 L/ha)** DyCleer or 4.46 L/ac **(11.0 L/ha)** DyCleer 2:4.

Baby's breath, fringed sage brush, lambkill, velvet grass and top growth of bracken fern, perennial cinquefoil and Russian knapweed: 4.46 L/ac **(11.0 L/ha)** DyCleer.

– TURF –

Clover, sheep sorrel, mouse-eared chickweed, erect knotweed: 0.61 L/ac **(1.5 L/ha)** DyCleer or 0.61 L DyCleer + 0.45 kg a.i. 2,4-D amine per acre (1.5 L DyCleer plus 1.1 kg a.i. of 2,4-D amine or L.V. ester/ha) for additional broad-leaf weed control or 1.11 L/ac **(2.75 L/ha)** DyCleer 2:4.

Alder, aspen, balsam fir, birch, elm, pin cherry, balsam poplar, spruce, willow: 20-28 kg/ac **(50-70 kg/ha)** DyCleer 10P.

Cherry or mixed species of above: 28-34 kg/ac **(70-85 kg/ha)** DyCleer 10P.

Water Volume: Apply only in water for deciduous and coniferous brush. Rate/1,000 L of water applied to point of run-off. For broad-leaf weed control: 45-90 L/ac **(110-220 L/ha)**. For turf: 45 L/ac **(110 L/ha)**. For poison ivy control: 225 L/ac **(560 L/ha)**.

8. SPRAY TIPS:

(a) Apply to brush foliage to the point of run-off and thorough coverage of weeds is essential for control.
(b) Brush and trees over 2 m should be cut and regrowth sprayed.
(c) Do not mix with oils.

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9. HOW IT WORKS: DyCleer is a systemic herbicide that is absorbed either through the roots or leaves and is translocated in the transport system by most plants. The exact mode of action is unknown, although it is suspected that there is disruption of normal metabolic and growth activities in the plant.

   DyCleer 10P is also systemic in that it dissolves in the soil water and is then moved into the root zone for pick-up by the roots and translocation within the plant.

10. EXPECTED RESULTS: With the DyCleer products one can expect excellent control of brush within a year of application. Effect on broad-leaf weeds may be seen in 10-14 days resulting in twisting and bending of the main stem, cupping of leaves, increase in root size and stimulation of fibrous root production.

    Conditions under which poor results may be expected:
    1. Rain within four hours of application may result in reduced effectiveness of the spray treatments.
    2. Since rain is required to dissolve the 10% pellet, lack of it will make the chemical unavailable to the plant and affect control.

    Precautions that should be followed:
    1. Avoid applications of spray treatments if temperatures exceed 25°C to reduce risk of chemical movement to off-target vegetation or crops.
    2. Avoid applications of spray treatments onto soil over the root systems of desirable trees and shrubs.
    3. Thoroughly clean application equipment after use.

11. EFFECTS OF RAINFALL: Rainfall four hours after application will not reduce effectiveness.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Table On Grazing and Hay Making Restrictions For Dairy Cattle

Rate	Days Delay Between Treatment and Grazing or Cutting For Hay For Dairy Cattle
Up to 0.6 L/ac **(1.5 L/ha)** DyCleer	0
0.6-1.11 L/ac **(1.5-2.75 L/ha)** DyCleer	7
1.11-2.23 L/ac **(2.75-5.50 L/ha)** DyCleer	14
2.23-4.46 L/ac **(5.50-11.0 L/ha)** DyCleer	30

1. If treated vegetation has been consumed by meat animals within 30 days of DyCleer application, feed the animals with untreated diet for 30 days before slaughter.
2. Meat animals may graze or feed treated pastures 30 days after DyCleer application without restrictions on slaughter.

14. TOXICITY:

Rats – oral LD_{50} (dicamba DMA salt) = 2,629 mg/kg
Rabbits – dermal LD_{50} (dicamba DMA salt) greater than 2,000 mg/kg
Fish – low order of toxicity
Wildfowl – low order of toxicity
Bees – Non-toxic

15. PRECAUTIONS AND FIRST AID: DyCleer may cause mild skin irritation, and swelling to the eyes.

- If on skin, wash with plenty of water.
- If in eyes, flush with water for 15 minutes and obtain medical attention.
- If swallowed, induce vomiting and get medical attention. Give plenty of water or milk to drink.
- Take labelled container with you to doctor.

16. STORAGE: Protect from freezing, but if frozen, no activity is lost if completely resuspended. Product stores indefinately.

17. WHERE AVAILABLE: Able Industries Ltd., Ace Vegetation Control Services Ltd., Midland Vegetation Control Ltd., Molsberry Division of Reichhold Ltd., Oliver Industrial Supply.

Additional information available from:

Velsicol Canada Inc.
1360 Blundell Road
Mississauga, Ontario
L4Y 1M5
Phone (416) 270-5112

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

DYVEL (dicamba + MCPA-K)

1. FORMULATIONS: Water soluble solution containing 84 g/L dicamba and 336 g/L MCPA potassium salt. Available 10 L containers.

2. REGISTERED MIXES: None

3. CROPS: Barley, oats and wheat.

   Underseeding: Legume underseeding not recommended.

4. WEEDS CONTROLLED: Hemp-nettle, cow cockle, wild buckwheat, green smartweed, lady's-thumb, corn spurry, Russian thistle, lamb's-quarters, pigweed (prostrate, redroot, Russian), mustard (Indian, wild, wormseed), ragweed (common, giant), stinkweed and cocklebur, also volunteer sunflowers, burdock, flixweed, ball mustard, hare's-ear mustard, tumble mustard, wild radish, false ragweed, shepherd's-purse, cleavers, kochia and Tartary buckwheat.

5. WEEDS SUPPRESSED: DyVel will control top growth of Canada thistle and sow-thistle.

6. WHEN USED: 2-3 leaf stage of crop. Best results will be obtained on hemp-nettle, corn spurry and cow cockle if application is made at the 2 to 3 leaf stage of the crop when these weeds are young.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	0.51 L/ac **(1.25 L/ha)** [One 10 L container will treat 19.76 ac (8 ha)]
Water Volume:	45 L/ac **(110 L/ha)**
Incorporation:	Not applicable
Pressure:	275 kPa
Ground Speed:	9 km/h
Nozzles:	Standard nozzles delivering 45 L/ac **(110 L/ha)**
Protective Equipment:	Standard protective clothing when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

   (a) Do not spray if rain is expected within four hours of application.
   (b) Best application is when crop is under good growing conditions and air temperature 10-25°C.
   (c) Avoid application if risk of severe drop in night temperature is forecast.
   (d) Avoid application when crop is under stress from disease or adverse environmental conditions.
   (e) Crop damage can occur if the chemical is applied at any time other than the recommended crop stage.

9. HOW IT WORKS: DyVel is a systemic herbicide that is absorbed through the roots as well as the aerial parts of the plants and translocated readily in the phloem and xylem system of plants. See inserts for dicamba and MCPA potassium salt.

10. EXPECTED RESULTS: See inserts for dicamba and MCPA potassium salt.

11. EFFECTS OF RAINFALL: Rainfall four hours after application will not reduce effectiveness.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or harvest for livestock feed prior to crop maturity.

14. TOXICITY:

   - has very low acute mammalian toxicity
     Dicamba: oral LD_{50} rats = 1,707-2,900 mg/kg
     MCPA: oral LD_{50} rats = 700 mg/kg
   - no human health problems have been observed after short-term or long-term exposure to Dyvel
   - non-toxic to birds, fish and bees

15. PRECAUTIONS AND FIRST AID: DyVel contact with skin, eyes and clothing should be avoided. In case of contact, wash skin with soap and water. Dyvel may cause some swelling to the eyes if in contact for prolonged periods.

   - Wash eyes with plenty of clean water for 15 minutes and get medical attention.
   - If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
   - Take labelled container to the doctor.

16. STORAGE: Protect from freezing but if frozen no activity is lost if completely resuspended. Product stores indefinitely.

17. AVAILABLE FROM: Cargill Grain, Pioneer Grain, United Grain Growers, Federated Co-op, Oliver Industrial Supply, Pfizer Chemical.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Additional information available from:

Velsicol Incorporated of Canada
1360 Blundell Road
Mississauga, Ontario
L4Y 1M5
Phone: (416) 270-5112

EMBUTOX E, 2,4-D BUTYRIC 400, COBUTOX 400 (2,4-DB)

1. FORMULATIONS: Emulsifiable concentrate 400 g/L
   Available in 4 and 20 L containers.

2. REGISTERED MIXES: Embutox E + Asulox F (alfalfa only)
   Embutox E + MCPA (sodium and K Salts)
   Cobutox 400 + MCPA amine
   2,4-D Butyric 400 – no registered mixes

   Mix Restrictions: Add Embutox E to the Asulox F already pre-mixed in the spray tank.

3. CROPS: Seedling alfalfa, seedling bird's-foot trefoil, seedling white and alsike clover, spring wheat, barley, oats, field corn, pastures.

   Underseeding: Can be used direct or underseeded.

4. WEEDS CONTROLLED: Bull thistle, Canada thistle, cocklebur, curled dock, field bindweed, lamb's-quarters, mustard (ball, wild* and wormseed), narrow-leaved hawk's-beard, oak-leaved goosefoot, perennial sow-thistle, plantain, ragweed, redroot pigweed, shepherd's-purse, smartweeds (annual), stinkweed, wild buckwheat, yellow rocket.

   * For better wild mustard control – tank mix 0.81 L Embutox E + 28 mL MCPA salt/ac **(2 L Embutox E with 70 mL of MCPA salt/ha)** use on seedling alfalfa and bird's-foot trefoil – some crop stunting may occur.

5. WEEDS SUPPRESSED:

6. WHEN USED: Spray when weeds are in the 1-3 leaf (seedling) stage.

   Seedling alfalfa and bird's-foot trefoil – 1-4 trifoliate leaf stage.
   Seedling white and alsike clover – after the first trifoliate leaf stage.
   Cereals – after the crop has 5 fully expanded leaves but before the early flag leaf stage.
   Field corn – after crop is 38 cm high but before the beginning of tasselling.
   Pastures – after cutting or grazing, and before regrowth is 7.5 cm high.

7. HOW TO APPLY:

   With: Ground equipment
   Rate: 1.1-1.72 L/ac **(2.75-4.25 L/ha)** [At the 1.1 L/ac **(2.75 L/ha)** rate one 20 L container will treat 18 ac **(7.3 ha)**]
   Water Volume: 60-80 L/ac **(150-200 L/ha)**
   Pressure: 275 kPa
   Ground Speed: 9 km/h
   Nozzles: All standard nozzles delivering 60-80 L/ac **(150-200 L/ha)**
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a face shield and apron when opening containers of emulsifiable concentrate.

8. SPRAYING TIPS:

   (a) Spray in warm weather when plants are growing well.
   (b) Do not spray in drought conditions.
   (c) Spray when weeds are at the susceptible stage.
   (d) Damage (especially to established alfalfa) in pastures containing forage legumes may occur and is likely to increase in severity the longer treatment is delayed beyond stage recommended.

9. HOW IT WORKS: Some plants convert 2,4-DB to 2,4-D quite efficiently, while others (such a alfalfa) do not. This factor is the basis for selective use in certain legumes.

10. EXPECTED RESULTS:

    Broad-leaved weeds: Should be dead within 2-3 weeks of treatment.

    Conditions under which poor results may be expected:
    1. Improper water volume.
    2. Weeds too far advanced.
    3. Very good growing conditions.

11. EFFECTS OF RAINFALL: Rainfall before the foliage has dried from the spraying may decrease activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.

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14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 1,960 mg/kg
- no short-term or long-term human health problems have been associated with Embutox E, 2,4-D Butyric 400 or Cobutox 400.
- toxic to fish; non-toxic to birds and bees

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist.

- If on skin, wash with soap and water.
- In in eyes, flush with plenty of clean water for 15 minutes and get medical attention.
- If swallowed, **do not induce vomiting**. Get medical attention immediately.
- Take labelled container to doctor.

16. STORAGE: No special precautions necessary.

17. WHERE AVAILABLE: Alberta Wheat Pool, Pioneer Grain, Co-op Farm Supply Centres, Pfizer Chemical Dealers, Niagara Chemical Dealers, Cargill Grain, Oliver Agricultural Supply, Green Cross Product Dealers, Chipman Inc., King Agriserve.

Additional information available from:

May & Baker Canada Inc.
1865 Sargent Avenue
Bay #2
Winnipeg, Manitoba
R3H OE4
Phone: (204) 774-1819
(Embutox E)

OR

Interprovincial Co-op Ltd.
Box 1050
Saskatoon, Saskatchewan
S7K 3M9
Phone: (306) 244-3408
(Cobutox)

Pfizer C & G Inc.
2140 Notre Dame Ave.
Winnipeg, Manitoba
R3H OK1
Phone: (204) 632-5216
(2,4-D Butyric 400)

EPTAM (EPTC)

1. FORMULATIONS: Emulsifiable concentrate 800 g/L
   Available in 20 L containers.
   Granular 10 G (10%)
   Available in 22.7 kg bags.

2. REGISTERED MIXES: Eptam 8-E + liquid fertilizer
   Eptam 8-E + granular fertilizer (except for nitrate based fertilizer).

3. CROPS: Alfalfa and bird's-foot trefoil, beans (snap or dry), flax, Irish potatoes, sunflowers, turnips (rutabagas), sugar beets.

   Underseeding: Not recommended

4. WEEDS CONTROLLED:

   Annual Grasses
   Annual blue grass
   Annual rye grass
   Barnyard grass
   Foxtails (green, yellow)
   Volunteer grains
   Wild oats

   Perennial Weeds
   Quackgrass
   for Perennial Weed

   Annual Broad-leaf Weeds
   Common chickweed
   Corn spurry
   Henbit
   Lamb's-quarters
   Hairy nightshade
   Pigweed (prostrate, redroot, tumble)
   Purslane

   NOTE: Refer to the label for
   special instructions
   Control

5. WEEDS SUPPRESSED: None

6. WHEN USED:

   Alfalfa and Bird's-foot Trefoil (New Seedings) – Just prior to planting. Eptam is not to be used if you are seeding a grain or grass nurse crop.

   Beans, Snap or Dry – Just prior to planting – Do not use Eptam on Adzuki beans, cow peas, soybeans, lima beans or other flat podded beans except Romano.

   Flax (Spring) – Apply just prior to planting. Do not apply in the spring on soils with less than 3% organic matter.

   Flax (Fall) – Apply just prior to freeze-up. The following spring just prior to seeding cultivate lightly to destroy any surviving winter germinating weeds.
   Potatoes – Eptam can be incorporated in the fall or spring, after drag-off, or just prior to the last cultivation. Liquid Eptam can also be metered into irrigation equipment. Do not apply within 45 days of harvest.

   Sunflowers – (Spring) Apply and incorporate prior to planting.
   Do not apply in the spring on soils with less than 3% organic matter.

   Turnips – Apply and incorporate 6-10 days prior to planting.

7. HOW TO APPLY:

   With: Ground equipment or irrigation water
   Rate: Alfalfa and Bird's-foot Trefoil – 1.72 L/ac **(4.25 L/ha)** or 13.8 kg/ac **(34 kg/ha)** of Granular Eptam
   Snap or Dry Beans – 1.72-2.23 L/ac
   (4.25-5.5 L/ha) or 13.8-18.2 kg/ac
   (34-45 kg/ha) of Granular Eptam
   Flax – Spring Treatment
   – Light soil 1.42 L/ac **(3.5 L/ha)** or 11.3 kg/ac **(28 kg/ha)** Granular Eptam
   – Heavy soil 1.72 L/ac **(4.25 L/ha)** or 13.8 L/ac **(34 kg/ha)** Granular Eptam
   Flax – Fall Treatment
   – Light Soil – 1.72 L/ac **(4.25 L/ha)** or 13.8 kg/ac **(34 kg/ha)** Granular Eptam
   – Heavy Soil – 2.23 L/ac **(5.5 L/ha)** or 18.2 kg/ac **(45 kg/ha)** Granular Eptam
   Special Precautions – Using Eptam on Flax Flax-Spring Treatment – Apply and incorporate 1.42-1.72 L/ac **(3.5-4.25 L/ha)** Eptam 8-E just before planting. Use the lower rate on lighter textured soils and the higher rate on heavier textured soils. Do not use on soils with less than 3% organic matter. Seed shallow, no deeper than 3 cms into a firm seedbed. With deep seeding reduced stands and crop damage may occur.
   Flax-Fall Treatment (Western Canada Only) – Apply and incorporate 1.72-2.23 L/ac **(4.25-5.5 L/ha)** Eptam 8-E in late fall before the ground freezes. Use the lower rate on light sandy soils and the higher rate on heavier textured soils. The following spring prior to seeding cultivate lightly to destroy any surviving winter germinating seeds. Seed shallow, no deeper than 3 cms, into a firm seedbed. With deep seeding reduced stands and crop damage may occur.

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Potatoes
  Before Planting – 2.23-4.46 L/ac
    (4.25-8.5 L/ha) or 13.8-27 kg/ac
    (34-67 kg/ha) Granular Eptam
  Drag-Off 2.23-4.46 L/ac **(4.25-8.5 L/ha)** or 13.8-27 kg/ac **(34-67 kg/ha)** Granular Eptam
  Post-Emergence 1.72-2.22 L/ac **(4.25-5.5 L/ha)** or 13.75-18.2 kg/ac **(34-45 kg/ha)** Granular Eptam
  Sprinkler Irrigation – 1.72-2.22 L/ac **(4.25-5.5 L/ha)**
  Fall Treatment – 2.22-3.44 L/ac **(5.5-8.5 L/ha)**
Sunflowers – Spring 1.72 L/ac **(4.25 L/ha)** or 13.75 kg/ac **(34 kg/ha)** Granular Eptam
  Fall – 1.72-2.22 L/ac **(4.25-5.5 L/ha)** or 13.75-18.2 kg/ac **(34-45 kg/ha)** Granular Eptam
Sugar Beets – Fall Treatment – 2.22 L/ac **(5.5 L/ha)** in late fall before ground freezes.
  Spring Treatment – 1.1-1.72 L/ac **(2.75-4.25 L/ha)** into first irrigation water immediately after clean cultivation.
Turnips – Sandy soil – 1.32 L/ac **(3.25 L/ha)** or 9.1 kg/ac **(22.5 kg/ha)** Granular Eptam
  – Heavy soil – 1.72 L/ha (4.25 L/ha) or 13.75 kg/ac **(34 kg/ha)** Granular Eptam

Water Volume: 40 L/ac **(100 L/ha)**

Incorporation: Following application of Eptam 8-E or 10G, the product should be incorporated immediately (within minutes) into the soil. The incorporation can be made with several types of implements. If using power-driven cultivation equipment, set the implement to cut 5-7.5 cm deep.

Tandem and One Way Discs should be set to cut 10-15 cm and should be operated at 6.5-9.5 km/h followed by harrows. Incorporation should be done twice in two different directions.

Field Cultivators – Recommended only for lighter soils in good tilth. Use 3-4 rows of sweeps spaced no wider than 18 cm. Sweeps should be at least 18 cm wide. Cut 10-15 cm deep at 9.5 km/h. The second incorporation must be made at an angle to the first. Harrows should be pulled behind the cultivator.

Pressure: Adequate to give the required spray pattern.
Ground Speed: 9 km/h
Nozzles: All standard and low pressure nozzles delivering approximately 40 L/ac **(100 L/ha)**
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of Eptam concentrate.
– plus respirator and goggles when opening bags of Eptam granules.

8. SPRAYING TIPS: When you are applying Eptam 8-E, use 40 L/ac **(100 L/ha)** low-pressure nozzles, which helps to eliminate spray drift and maximize soil coverage.

   For exact and detailed instructions for applying Eptam through irrigation water (herbigation), please consult the label.

   When applying Eptam 8-E with granular fertilizer, a minimum of 81 kg/ac **(200 kg/ha)** of fertilizer is required. See product label for further instructions.

9. HOW IT WORKS: Eptam is taken up by the roots and shoots of a germinating weed. The Eptam taken into the weed disrupts and stops further growth. Eptam is not persistant in the soil, however, it will give effective weed control for approximately 6-8 weeks.

10. EXPECTED RESULTS:

    Weeds: Eptam controls a wide variety of weeds at the time when weed control is essential. Eptam controls the weeds before they can compete for moisture and nutrients needed by the crop.
    Since Eptam is absorbed by the weed shoot, most effected weeds will not emerge. Numerous chlorotic and bleached shoots may be visible by removing the top few inches of treated soil.

    Crop: Applied according to directions and under normal growing conditions, Eptam 8-E will not harm the treated crop. However, during germination and early stages of growth, unusually cold and wet, or hot and dry weather, insect, nematode, or plant disease attack, the use of certain soil-applied systemic insecticides, highly saline or alkaline soil conditions, improperly placed fertilizers or soil insecticides may create abnormal conditions that weaken crop seedlings. Eptam 8-E used under these conditions could result in crop injury.

    Conditions under which poor results may be expected:
    1. Conditions not suitable for application and incorporation (i.e. wet, cloddy soils).

11. EFFECTS OF RAINFALL: Eptam is very soluble in water and excessive moisture may leach Eptam from the surface.

12. MOVEMENT IN SOIL: Eptam will move readily in the soil.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Danger from drift is low
    Grazing Restrictions: None
    Crop Use After Hail: No restrictions
    Succeeding Crops: No restrictions

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 1,652 mg/kg
  oral LD_{50} mice = 3,160 mg/kg
  dermal LD_{50} rabbits = 10,000 mg/kg
- no short-term or long-term human health problems have been observed for Eptam
- very toxic to fish; non-toxic to birds

15. PRECAUTIONS AND FIRST AID: Avoid contact of Eptam, liquid or granules with skin and eyes, and do not inhale dust or spray mist.

- If on skin, wash with soap and water.
- If in eyes, flush with clean water for 15 minutes. Get medical attention.
- If swallowed, **do not induce vomiting**. Seek medical attention.
- Take labelled container to doctor.
- Take the information on Eptam, in this booklet with you to doctor.

FOR PHYSICIAN:

1. **Do not** induce vomiting or lavage stomach. Aspiration pneumonia from solvent (kerosene) may complicate or overshadow poisoning.
2. Give symptomatic and supportive treatment. Consult your local Poison Control Center for additional information.

16. STORAGE: Eptam is not affected by freezing temperatures and thus does not require heated storage. Eptam should be stored away from all seed and fertilizer.

17. WHERE AVAILABLE: From major grain companies and many independent farm supply dealers.

Additional information available from:

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421

ERADICANE 8-E (EPTC + R25788)

1. FORMULATIONS: Emulsifiable concentrate, 800 g/L
Available in 22.7 L containers

2. REGISTERED MIXES: Eradicane + liquid fertilizer

Mix restrictions: Compatibility test
Mixing with other pesticides: Not recommended

3. CROPS: Corn

Underseeding: Not recommended

4. WEEDS CONTROLLED:

Annual Grasses
Annual blue grass
Annual rye grass
Barnyard grass
Fall panicum
Green & yellow foxtail
Volunteer grain
Wild oats

Perennial Weeds
Quackgrass

Annual Broad-leaf Weeds
Common chickweed
Corn spurry
Henbit
Lamb's-quarters
Hairy nightshade
Pigweed (prostrate, redroot, tumble)
Purslane

NOTE: Refer to the label for special instructions for Perennial Weed Control.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Apply and incorporate Eradicane 8-E prior to planting the corn crop. Seeding should be done as soon as possible to obtain a maximum period of weed control.

7. HOW TO APPLY:

With:	Ground equipment only
Rate:	1.72-3.34 L/ac **(4.25-8.25 L/ha)**, use 2.23 L/ac **(5.5 L/ha)** for sweet corn. [One 20 L container treats 11.6 ac (4.7 L/ha) at 1.72 L/ac **(4.25 L/ha)**]
Water Volume:	Ground – 40 L/ac **(100 L/ha)**
Incorporation:	Immediately (within minutes) following application, should be made using power-driven cultivation equipment set to cut 5-7.5 cm deep, or tandem discs or one-way discs set 10-15 cm deep, or a Danish-type cultivator with tines set 15-20 cm apart at a depth of 10 cm. They should be operated at a speed of 6.5-9.5 km/h for power-driven cultivation equipment and discs and at least 9.5-13 km/h for cultivators. This is to ensure adequate mixing of the soil. A second working should be made at right angles to the first operation for further mixing of the soil.
Pressure:	Adequate to give proper spray pattern.
Ground Speed:	9 km/h
Nozzles:	All standard and low pressure nozzles delivering approximately 40 L/ac **(100 L/ha)**.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS: When applying Eradicane 8-E use a 40 L/ac **(100 L/ha)** high-volume low pressure nozzle, which helps to eliminate spray drift and maximize soil coverage.

For exact and detailed instructions for applying Eradicane through irrigation water (herbigation), please consult label.

9. HOW IT WORKS: Eradicane is taken up from the soil by the roots and shoot of a germinating weed. It disrupts and stops further growth of the weed, which results in the death of the weed.

10. EXPECTED RESULTS:

Weeds: Eradicane 8-E controls a wide variety of annual weeds in corn crops when weed control is essential. Eradicane controls the weeds before they can compete for moisture and nutrients needed by the crop. Since Eradicane is absorbed by the weed shoot, most affected weeds will not emerge. Numerous chlorotic and bleached shoots may be visible by removing the top few inches of treated soil.

Crop: Applied according to directions and under normal growing conditions, Eradicane 8-E will not harm the treated crop. However, during germination and early stages of growth, unusually cold and wet or hot and dry weather, insect,

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

nematode, or plant disease attack, the use of certain soil-applied systemic insecticides, highly saline or alkaline soil conditions, improperly placed fertilizers or soil insecticides may create abnormal conditions that weaken crop seedlings. Eradicane 8-E used under these abnormal conditions could result in crop injury.

Conditions under which poor results may be expected:
1. Conditions not suitable for application and incorporation (i.e. wet, cloddy soils).

11. EFFECTS OF RAINFALL: Eradicane is very soluble in water and excessive moisture may leach Eradicane from the surface. This is not generally a problem.

12. MOVEMENT IN SOIL: Eradicane will move readily in the soil.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is low
Grazing Restrictions: None
Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 1,652 mg/kg
- no short-term or long-term human health problems have been associated with this product

15. PRECAUTIONS AND FIRST AID: Avoid inhaling spray mist. Do not get into eyes or on skin.

- If on skin, wash with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, **do not induce vomiting** because of petroleum distillates in formulation. See a doctor immediately.
- Take labelled container to doctor.
- Take the information on Eradicane in this booklet with you to doctor.

FOR PHYSICIAN: Do not induce vomiting or lavage stomach. Give symptomatic and supportive treatment.

16. STORAGE: Eradicane does not require heated storage and is not affected by freezing temperatures. It should, however, be stored away from all seeds and fertilizers.

17. WHERE AVAILABLE: From major grain companies and many independent farm supply dealers.

Additional information available from:

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421

ERAMOX (atrazine + simazine)

1. FORMULATIONS: Wettable powder containing 40% technical atrazine + 40% technical simazine. Packaged in 25 kg containers.

2. REGISTERED MIXES: None

3. CROPS: Total weed control and bare ground maintenance on non-cropped land.

4. WEEDS CONTROLLED: Most annual and perennial broad-leaf weeds and grasses found on non-cropped land. Milkweed and horsetail may require more than one treatment.

5. WEEDS SUPPRESSED:

6. WHEN USED: April and May OR August to freeze-up

   NOTE: Spring applications can be extended for a further month if rainfall and soil moisture are plentiful.

7. HOW TO APPLY:

With:	Equipment that will apply up to 900 L/ac **(2,200 L/ha)**
Rate:	5.75-11.5 kg/ac **(14.2-28.4 kg/ha)**
Water Volume:	90-900 L/ac **(225-2,200 L/ha)**
Incorporation:	Not applicable
Pressure:	210-315 kPa
Ground Speed:	Sufficient for good coverage.
Protective Equipment:	Standard protective clothing used when applying herbicides. - plus a respirator and goggles when opening Eramox containers.

8. SPRAYING TIPS: Prepare slurry and add while filling tank with water. Provide gentle agitation during mixing and spraying. Do not use nozzle screens finer than 50 mesh.

9. HOW IT WORKS: Eramox is a formulation of two triazines that are taken up mainly by weed roots but there may also be some herbicidal effect by absorption through foliage. The triazine herbicides are potent inhibitors of the Hill reaction, ie. they are photosynthetic inhibitors. Triazines also affect uptake of nutrients and changes in the nitrogen metabolism seem to occur.

10. EXPECTED RESULTS: Failure of weeds to emerge or, depending on weather conditions, weeds may die back soon after emergence.

11. EFFECTS OF RAINFALL: Average to moderate rainfall can enhance performance. Very heavy rainfall on sandy soils can cause some leaching and thus a decrease in efficacy.

12. MOVEMENT IN SOIL: Although of low solubility, Eramox 80W tends to penetrate well into the soil and it may creep to some extent especially on sloping ground.

13. GRAZING AND CROPPING RESTRICTIONS: Not applicable. For use on non-cropped land.

14. TOXICITY:

    - has very low acute mammalian toxicity
      80W atrazine: oral LD_{50} rats = 3,080 mg/kg
      80W simazine: oral LD_{50} rats = 5,000 mg/kg
    - **may cause dermatitis after prolonged exposure**
    - non-toxic to fish and birds

15. PRECAUTIONS AND FIRST AID: Eramox should not be allowed to make prolonged contact with the skin.

    - If on skin, wash thoroughly with soap and water.
    - If in eyes, wash for 15 minutes with clean water and get medical attention.
    - If swallowed, induce vomiting. Give plenty of water to drink. Get medical attention.
    - Take labelled container to doctor.
    - Take the information on Eramox in this booklet to the doctor.

    FOR PHYSICIAN: If ingested accidentally, there is no specific antidote. Induce emesis or lavage stomach. Give a saline laxative and supportive therapy.

16. STORAGE: Store in dry area, heating not required.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE: Midland Vegetation Control Inc.

Additional information available from:

Ciba-Geigy Canada Ltd.
6860 Century Avenue
Mississauga, Ontario
L5N 2W5
Phone: (416) 836-9445

ESTAPROP (2,4-D + dichlorprop)

1. FORMULATIONS: Emulsifiable concentrate 300 g/L 2,4-D + 300 g/L dichlorprop.
Available in 20 L containers.

2. REGISTERED MIXES: None

3. CROPS: Spring and winter wheat, barley

Underseeding: Legume underseeding not recommended.

4. WEEDS CONTROLLED: Bluebur, buckwheat (Tartary and wild), cocklebur, flixweed, kochia, lamb's-quarters, mustard (ball, dog, hare's-ear, Indian, tumble, wild, wormseed), oak-leaved goosefoot, pigweed (redroot and Russian), ragweeds, Russian thistle, shepherd's-purse, smartweeds (annual), sow-thistle (annual), stinkweed, stork's-bill.

5. WEEDS SUPPRESSED: Canada thistle, curled dock, perennial sow-thistle.

6. WHEN USED:

- Between the 4 leaf and flag leaf stage for spring seeded crops.
- Between full tillering and flag-leaf for fall seeded crops.

7. HOW TO APPLY:

With: No application restrictions specified
Rate: 0.71 L/ac **(1.75 L/ha)** [a 20 L container will treat 28.4 ac (11.5 ha)]
Water Volume: 20-80 L/ac **(50-200 L/ha)**
Pressure: Sufficient for good coverage
Nozzles: 20-80 L/ac **(50-200 L/ha)** nozzles providing uniform spray coverage
Protective Equipment: Standard protective clothing used when applying herbicides.
- plus face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS: None specified.

9. HOW IT WORKS: Estaprop is a systemic herbicide which is absorbed by leaf and stem surfaces and concentrated in the growing region of the weed. Here it disrupts cell division and increases respiration. This results in stoppage of growth, twisting and curling of leaves and stems, browning and eventual death.

10. EXPECTED RESULTS: Twisting and curling of weeds will commence 2-10 days after application depending on weather conditions.

Conditions under which poor results may be expected:
1. Poor coverage.
2. Low relative humidity during and after spraying.

11. EFFECTS OF RAINFALL: No information available.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Drift onto crops such as peas, beans, sugar beets, tomatoes, clover, alfalfa, rapeseed, sunflowers, potatoes, turnips, garden flowers, trees and shrubs will cause injury.
Grazing Restrictions: Do not graze within 14 days of application.
Crop Use After Hail: No restrictions if 14 days after applicatinn.

14. TOXICITY:

- has slightly high acute toxicity to mammals
  oral LD_{50} mice = 400 mg/kg
- no short-term or long-term human health problems have been associated with Estaprop
- this formulation contains no dioxin

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, flush with clean water for 15 minutes and get medical attention.
- If swallowed, **do not induce vomiting.** Rush person to nearest hospital.
- Take labelled container to doctor.

16. STORAGE: May be stored at any temperature. Shake well after storing for one year or longer.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE: Niagara Chemical Dealers.

Additional information available from:

Niagara Chemical
Division of Reichhold Limited
1274 Plains Road East
Box 5004
Burlington, Ontario
L7R 3Z1
Phone: (416) 634-2355

ESTEMINE

1. FORMULATIONS: Estemine 2,4-D – 500 g/L active ingredient
Estemine MCPA – 500 g/L active ingredient
Available in 2 x 10 litre plastic containers.

2. REGISTERED MIXES:

Estemine 2,4-D + Banvel
Estemine 2,4-D + Pardner
Estemine 2,4-D + TCA
Estemine 2,4-D + Torch
Estemine MCPA + TCA
Estemine MCPA + 28-0-0 (Liquid Nitrogen)

Estemine MCPA + Afolan F
Estemine MCPA + Banvel
Estemine MCPA + Lorox
Estemine MCPA + Pardner
Estemine MCPA + Torch

3. CROPS: Wheat (winter and spring), barley, rye, oats (estemine MCPA only), corn (Estemine 2,4-D only), Flax (Estemine MCPA only).

Underseeding: Not recommended to underseed to legumes.

4. WEEDS CONTROLLED: Mustards, pigweed (prostrate, Russian), wild radish, ragweeds, shepherd's-purse, thyme-leaved spurge, stinkweed, common burdock, bluebur, cocklebur, flixweed, goat's-beard, kochia, lamb's-quarters, prickly lettuce, hairy galinsoga, goosefoot, dog mustard, common peppergrass, pigweed (redroot, tumble), pineapple weed, purslane, Russian thistle, annual sow-thistle, biennial wormwood, American dragonhead*, hemp-nettle*.

* Estemine MCPA only.

5. WHEN USED:

Spring Wheat and Barley – **Estemine 2,4-D** should not be used until the fourth leaf of the crop (15 cm in height). Treatments can then be made safely until early boot stage and again from soft dough stage to maturity. **Estemine MCPA** can be used from the 3-leaf expanded to the early flag-leaf stage and again from the milk stage to full maturity.

Winter Wheat and Rye – Should be treated in the spring from the time the crop commences growth to early boot stage with either Estemine MCPA or Estemine 2,4-D.

Oats – It is advisable to use MCPA on oats instead of 2,4-D. Estemine MCPA can be applied as soon as weed conditions warrant until flag-leaf stage.

Corn – Use Estemine 2,4-D only. Apply over the top up to the 15 cm (leaf-extended). If corn is over 15 cm, use drop pipes to direct spray away from corn leaves.

Flax – Use Estemine MCPA only. Apply from the 5 cm crop stage to just before pre-bud.

6. HOW TO APPLY:

With: Ground equipment or aircraft.

Rate:
1. 283-445 mL/ac **(700 mL-1.1 L/ha)** or 506-708 mL/ac **(1.25-1.75 L/ha)** on spring or winter cereals.
2. Estemine MCPA (only) at 405 mL/ac **(1.0 L/ha)** + 28-0-0 (Liquid Nitrogen) at a minimum of 45 L/ac **(112 L/ha)** on winter wheat and winter rye.
3. Estemine MCPA (only) at 344 mL/ac **(850 mL/ha)** on flax.
4. Estemine 2,4-D (only) at 283-445 mL/ac **(750 mL-1.1 L/ha)** on corn.
5. Estemine 2,4-D at 607-1112 ml/ac **(1.5-2.75 L/ha)** on Pastures, Turf and Fairways (not on bent grasses) and Estemine MCPA at 910-1112 mL/ac **(2.25-2.75 L/ha)** on Turf, Lawns and Fairways (use low rate on bent grass).

Note: The higher rates given are recommended under drier conditions, for less susceptible weeds and crops that are heavily infested with weeds.

Water Volume: Aircraft: minimum 8 L/ac **(20 L/ha)**
Ground: minimum 40 L/ac **(100 L/ha)**
– except on pastures (2,4-D only) and turf, use enough water for thorough coverage.

Incorporation: Not applicable.
Pressure: 275 kPa
Nozzles: Standard nozzles delivering a minimum of 40 L/ha (100 L/ac)
Protective Equipment: Standard protective clothing used when applying herbicides.

7. SPRAYING TIPS: Apply in the amount of water required for even distribution. Spray during warm weather when the weeds are young and growing actively. Do not mix Estemine with oil for aircraft or other applications.

8. HOW IT WORKS: Estemine is absorbed readily by the leaves. It translocates in the phloem moving with the food or in the transpiration stream. It is a hormone type herbicide causing an abnormal growth response and affects respiration, food reserves and cell division.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

9. EXPECTED RESULTS: Susceptible plants become malformed before they die.

10. EFFECTS OF RAINFALL: A rain free period of one hour is usually sufficient for effective weed control under good growing conditions.

11. MOVEMENT IN SOIL: Under normal use conditions leaching does not pose a problem.

12. GRAZING AND CROPPING RESTRICTIONS: Do not use on turf bent grasses or on newly seeded grass until after the third mowing. Clovers may be damaged by treatment. Do not allow spray drift to contact vegetables, flowers, grapes, fruit crops, ornamentals or other desirable plants which are sensitive to 2,4-D.

    Succeeding Crops: No restrictions.

13. TOXICITY:

    - human health: may cause some skin irritation. May cause minimal irritation of lungs, nose and throat.
      Rats – LD_{50} values range from 600-1400 mg/kg
    - wildlife and fish: may be toxic to fish and should not be introduced into aquatic environments.

14. PRECAUTIONS AND FIRST AID: Causes eye and skin irritation. Avoid breathing spray mist. Effects of overexposure: irritation, burning sensation in eyes, nose, mouth and lungs; weakness, dizziness, loss of co-ordination. Large oral doses may produce vomiting, diarrhea, chest and abdominal pain. Prolonged or repeated contact may cause dermatitis.

    - If on skin, wash off with soap and water.
    - If in eyes, flush with clean water for 15 minutes.
    - If swallowed, drink water; induce vomiting unless unconscious. Obtain medical attention.
    - If inhaled, move to fresh air or provide a respirator.
    - Take labelled container to doctor.

15. STORAGE: Store in heated and dry area. Do not allow to freeze.
    Store away from fertilizers, feeds, foodstuffs, seeds, insecticides or fungicides.

16. WHERE AVAILABLE: Green Cross Product Dealers.

    Additional information available from:

    Green Cross
    820 – 26 Street N.E.
    Calgary, Alberta
    T2A 2M4

FUSILADE^{R} (fluazifop-butyl)

1. FORMULATIONS: Emulsifiable concentrate containing 250 g/L
   Available in 8 L containers.

2. REGISTERED MIXES: Fusilade + 2,4-DB
   Fusilade + Lexone^{R}
   Fusilade + Sencor^{R}

3. CROPS: Flax, sugar beets, sunflowers, alfalfa*, red clover*, bird's-foot trefoil*, potatoes.

   * Do not harvest for feed or graze livestock in the year of treatment.

4. WEEDS CONTROLLED: Volunteer, corn, barnyard grass, Johnson grass, Persian darnel, volunteer wheat, volunteer barley, wild oats, wild proso millet, crabgrass, yellow and green foxtail, quackgrass.

5. WEEDS SUPPRESSED: At lower rate, yellow and green foxtail (Western Canada).

6. WHEN USED: 2-6 leaf stage of volunteer corn, barnyard grass, Johnson grass, Persian darnel, volunteer wheat, volunteer barley, wild oats, wild proso millet, crabgrass, 2-4 leaf stage of yellow and green foxtail; 3-5 leaf stage of actively growing quackgrass.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	Volunteer corn: 0.24 L/ac **(0.6 L/ha)**. Barnyard grass, Johnson grass, Persian darnel, volunteer barley, volunteer wheat: 0.32 L/ac **(0.8 L/ha)**. Wild Oats, wild proso millet, crabgrass, and suppression of green and yellow foxtail (Western Canada): 0.40 L/ac **(1.0 L/ha)**. Green and yellow foxtail (Western Canada): 0.57 L/ac **(1.4 L/ha)**. Quackgrass (tilled land): 0.81 L/ac **(2.0 L/ha)**. Quackgrass (non-tilled land): 1.21-1.62 L/ac **(3.0-4.0 L/ha)**. [A 8 L container at 0.32 L/ac **(0.8 L/ha)** will treat 25 ac (10 ha)].
Water Volume:	40-120 L/ac **(100-300 L/ha)**
Incorporation:	Not applicable
Pressure:	200-300 kPa
Ground Speed:	Sufficient to ensure complete coverage.
Nozzles:	Standard flat fan nozzles.
Protective Equipment:	Standard protective clothing used when applying herbicides.

8. SPRAYING TIPS:

   (a) Fusilade will be less effective when plants are stressed by lack of moisture, low temperature and/or very low relative humidity.
   (b) Fusilade must be applied 3 days before the use of any broadleaf herbicide.
   (c) Rhizomes of quackgrass should be thoroughly fragmented by tillage prior to the application of Fusilade to obtain control at the lower rate.
   (d) Do not cultivate for five days after applying Fusilade.
   (e) Always add Agral^{R} 90 at the rate of 1 L for every 1,000 L of spray solution (0.1% by volume). Do not add Agral^{R} 90 when tank mixed with other herbicides.

9. HOW IT WORKS: Fusilade is a systemic herbicide which is translocated from the treated areas to the growing points of leaves, shoots, roots or rhizomes.

10. EXPECTED RESULTS: Weeds will not die immediately after treatment but will cease growth and not compete with the crop. The process of killing the foliage rhizomes and the entire plant takes several weeks.

11. EFFECTS OF RAINFALL: Fusilade activity is not affected by rainfall commencing two hours after application.

12. MOVEMENT IN SOIL: The relatively short half life and low mobility of Fusilade in soil ensures that leaching will not constitute a problem.

13. GRAZING AND CROPPING RESTRICTIONS: Do not harvest alfalfa, red clover, and bird's-foot trefoil for feed or graze livestock in the year of treatment.

14. TOXICITY:

    Active Ingredient:
    Acute oral LD_{50} = 3,300 mg/kg
    Acute dermal LD_{50} = 5,000 mg/kg

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Product:

Acute oral LD_{50} = 4,770 mg/kg
Acute dermal LD_{50} = 2,000 mg/kg

Product contains 70% petroleum distillate. Treat symptomatically for ingestion and/or skin and eye contact.

15. PRECAUTIONS AND FIRST AID: Harmful if swallowed. Causes eye and skin irritation; wear an eye shield or rubber gloves when handling the concentrate. Avoid spray mist by staying upwind from the spray and/or by wearing a suitable mask or respirator. Wash thoroughly with soap or water after handling and before eating or smoking. Remove contaminated clothing and wash before re-use.

16. STORAGE: Product is unaffected by temperatures below 0°C.

17. WHERE AVAILABLE: Chipman Inc.

Additional information available from:

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 772-0434

GLEAN* WEED KILLER

1. FORMULATIONS: Dry Flowable 75%
   Available in a 500 g container.

2. REGISTERED MIXES: None

3. CROPS: Wheat (spring and durum) and barley.

4. WEEDS CONTROLLED: Lamb's-quarters, hemp-nettle, wild mustard, volunteer rapeseed, redroot pigweed, stinkweed, lady's-thumb, green smartweed, cow cockle, chickweed, kochia, cleavers, Canada thistle, wild buckwheat, Russian thistle.

5. WEEDS SUPPRESSED: None.

6. WHEN USED: Post-emergence when wheat or barley is in the 2 leaf to flag leaf (shot blade) stage.

7. HOW TO APPLY:

With: Ground equipment
Rate: 6.1-12.2 g/ac **(15-30 g/ha)**
Water Volume: 25 L/ac **(60 L/ha)** (minimum)
Incorporation: Not applicable
Pressure: Sufficient for good coverage
Ground Speed: Not restricted
Nozzles: Flat fan types are recommended. Increased water volumes are required for flood jet or "Raindrop" nozzles.
Surfactant: Use 100 ml/100 L spray mixture of Agsurf, Agral 90, or Citowett Plus.
Protective Equipment: Standard protective equipment used when applying herbicides.

8. SPRAYING TIPS:

(a) Use 50 mesh screens or larger.
(b) Use higher spray volumes when crop canopy is dense and/or weeds are large.

9. HOW IT WORKS: "Glean" is readily taken up by the foliage and roots of plants and moves rapidly throughout the plant. Very soon after application, all growth in sensitive plants will stop.

10. EXPECTED RESULTS:

Weeds: Within a few hours after application, all growth of susceptible weeds will have stopped. Approximately 1-3 weeks after application discolouration (yellowing or purpling) will occur and then complete desiccation will occur. "Glean" remains active in the soil throughout the growing season to control later germinating weeds.

Crops: Temporary lightening of colour may occur particularly if heavy rainfall occurs immediately after application.

Conditions under which poor results may be expected:
1. Poor coverage.
2. Weeds too large when sprayed.

11. EFFECTS OF RAINFALL: Rainfall immediately after application may cause temporary lightening of crop colour. Control of weed seedlings is enhanced by rains which are sufficient to improve plant growth.

12. MOVEMENT IN SOIL: Movement is retricted by fine textured soils, soil organic matter and neutral to acidic conditions.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Do not allow spray to drift onto adjacent crops as injury to the crop may occur. Do not apply "Glean" near fields scheduled to be planted to crops other than wheat, or planted to crops other than wheat or barley. Extreme care must be taken to prevent drift onto desirable plants or non-target agricultural land.
Succeeding Crops: "Glean" may only be used on land having a pH of 7.5 or lower and dedicated exclusively to the production of wheat and/or barley.

On soils with a pH of 7.0 or lower, wheat or barley may be seeded the season following an application of "Glean". On soils with a pH of 7.0 to 7.5 only wheat may be seeded the season following an application of "Glean". On these soils (pH 7.0 to 7.5) barley may be seeded the second season (24 months) following an application of "Glean".

Grazing restrictions: None.

14. TOXICITY:

Fish and Wildlife: Bluegill sunfish and rainbow trout LC_{50}
(96 hr) greater than 250 ppm.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Mallard duck and bobwhite quail LD_{50} greater than 5,000 ppm.

Mallard duck and bobwhite quail 8-day dietary LC_{50} greater than 5,000 mg/kg.

Male rat LD_{50} = 5,545 mg/kg.

Female rat LD_{50} = 6,293 mg/kg.

(All results based on technical material)

15. PRECAUTIONS AND FIRST AID: Avoid breathing spray mist and avoid contact with skin, eyes, and clothing.

16. STORAGE: Store in a cool, dry place.

17. WHERE AVAILABLE: Alberta Wheat Pool, Federated Co-operatives Ltd. Pfizer Chemical Dealers, United Grain Growers, Chipman Inc.

Additional information available from:

DuPont Canada Inc.
Regency Centre #105
333 – 25 Street East
Saskatoon, Saskatchewan
SLK OL4
Phone: (306) 244-4511

GRAMOXONE (paraquat)

1. FORMULATIONS: Water soluble solution 200 g/L
   Available in 1 and 5 L containers

2. REGISTERED MIXES: None applicable to Alberta

   Mix restrictions: Not applicable
   Mixing with other pesticides: Not recommended

3. CROPS: Shelterbelts, stale seedbed for vegetables and field crops, potatoes, sugar beets, non-crop land, and chemical mowing.

4. WEEDS CONTROLLED: The herbicidal effect varies with weed species, hence repeat applications may be necessary on certain perennial weeds. Annual weeds are generally killed with one application if the weed growth has been completely covered with the spray solution.

5. WEEDS SUPPRESSED: Most perennial weeds.

6. WHEN USED: Generally prior to the emergence of a crop, but after weeds emerge. For best results use Gramoxone at an early stage of the weed's development.

7. HOW TO APPLY:

With: Ground equipment only.

Rate: **Grass and Weed Control in Shelterbelts**: Apply 2.2 L Gramoxone in 440 L of water/ac **(5.5 L Gramoxone in 1,100 L of water/ha)** or 0.075 L in 10 L of water/100 m^2. O.55 L of this mixture will treat an area 1.75 m in diameter around a tree.

Weed Control with Stale Bed Technique for Vegetable & Field Crops: Pre-emergent to crop. Post-emergent to weeds: For weed control in beans (all types), beets, carrots, cole crops, corn, cucumbers, onions, peas, potatoes, soybeans, sugar beets and turnips, prepare a seedbed at least 2-4 weeks before seeding to stimulate weed growth. Seed without further cultivation and with a minimum disturbance of the soil. To burn off emerged weeds apply 1.1-2.2 L Gramoxone in 120-440 L of water/ac **(2.75-5.5 L Gramoxone in 300-1,100 L of water/ha)** prior to or after seeding. Do not apply later than 3 days before crop emergence. Use 2.2 L/ac **(5.5 L/ha)** when weeds are above 5 cm in height, and higher volume of water on dense weed growth.

Potoates: Apply up to ground crack only for Netted Gems and Cherokee. For other varieties apply up to the time the first potato tops have reached 5-8 cm. Apply 1.1-1.72 L in 120-200 L of water/ac **(2.75-4.25 L in 300-500 L of water/ha)** for control of quackgrass, annual grasses and broad-leaf weeds. To control emerged seedling grasses and broad-leaf weeds use only 0.61 L of Gramoxone in 120-220 L of clean water/ac **(1.5 L of Gramoxone in 300-550 L of clean water/ha)**.

NOTE: Application to exposed or emerged potato foliage will cause temporary injury and chlorosis. Do not apply to emerged potato foliage in the evening, or when potatoes are under moisture stress due to extremely dry soil conditions, or to early potatoes. The use of poor or diseased seed and cut seed with one eye will make potatoes more susceptible to injury by post-emergence Gramoxone sprays. This treatment will normally eliminate several cultivations, but has no residual action and will not control growth of weeds which may take place following the application of Gramoxone.

Weed Control in Non-Crop Land: Gramoxone will provide a rapid top kill of weeds and grasses when applied as a foilar spray. Apply 2.2-4.4 L of Gramoxone in 220-440 L/ac **(5.5-11 L of Gramoxone in 500-1,100 L of water/ha)** thoroughly wetting all foliage.

Chemical Mowing: For rapid scorch of weeds and grasses, apply 1.1 L of Gramoxone in 220-440 L of water/ac **(2.75 L of Gramoxone in 550-1,100 L of water/ha)**, thoroughly wetting all foliage. This rate may also be used with some residual herbicides to improve the initial top kill of the residual herbicide.

For Weed Control in Non-Crop Land and Chemical Mowing: Gramoxone may be added to tank mixes of certain residual herbicides where immediate top kill and long-term sterilization is required. The use of such combinations for the above two uses, should be based on previous experimental experience, and recommendations on the label of the residual herbicide.

Water Volume: Given in above section. Thoroughly wet all foliage. For dense weed growth use the higher volume of water.
Incorporation: Not applicable
Pressure: 300 kPa
Ground Speed: 9 km/h
Nozzles: All standard nozzles delivering the correct volume.
Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening containers of liquid concentrate.

8. SPRAYING TIPS:

   (a) Use high volume, low pressure type spraying equipment to apply the appropriate volume of spray. Foliage must be thoroughly covered to obtain good results. Special equipment is necessary for use on some row crops. This equipment shields the crops from the spray.

(b) Applications made on cloudy days, during dull sunlight or just prior to or during periods of darkness will generally increase the subsequent effectiveness of the treatment.
(c) Do not apply with mist blowers.
(d) It is important to thoroughly wash equipment after spraying – use a wetting agent (Agral 90 at 60 mL/100 L of water), flush and spray out, then thoroughly rinse with clean water. When possible, the equipment should be fill with clean water and left overnight. Spray out before storing equipment or using other materials.

9. HOW IT WORKS: Gramoxone is absorbed by all leaf and stem surfaces, but it does not move in the plant. Once inside the plant, Gramoxone interferes with the photosynthetic process of the plant. This is followed by yellowing and eventual death of the plant.

10. EXPECTED RESULTS:

Weeds: Gramoxone provides immediate, fast and virtually complete annual weed kill with only one application in most cases. Repeat applications may be necessary when dealing with perennial weeds. Usually yellowing will occur within a few hours of application. Desiccation of the plant will continue rapidly and eventual death will occur.

Crop: Gramoxone is inactivated on contact with the soil, therefore it has no residual effect in the soil.

Conditions under which poor results may be expected:
1. Rain prior to the spray solution drying on plant.
2. Use clean (non-turbid) water for spraying Gramoxone. Muddy water will reduce the effectiveness of the chemical.
3. Inadequate coverage of green foliage.

11. EFFECTS OF RAINFALL: Once the spray solution has dried on the plant tissue, rain will not reduce the effectiveness of Gramoxone.

12. MOVEMENT IN SOIL: Gramoxone binds to the soil and becomes biologically unavailable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Avoid application or drift onto crops, ornamental plants, lawns, grazing areas or other desirable growth.
Grazing Restrictions: Not applicable
Crop Use After Hail: No restriction
Succeeding Crops: No restriction

14. TOXICITY:

- has **very high** acute mammalian toxicity
  oral LD_{50} rats = 120 mg/kg
  dermal LD_{50} rabbits = 480 mg/kg
- **symptoms of acute poisoning may occur after use in man**
- **long-term inhalation exposure to Gramoxone may cause lung damage**

15. PRECAUTIONS AND FIRST AID: Do not inhale Gramoxone spray mist.
Therefore, avoid spraying on windy days. Use of a respirator while spraying, is recommended.

- If on skin, wash with soap and water **immediately.**
- If in eyes, flush with water for 15 minutes and get medical attention **immediately.**
- If swallowed, induce vomiting. Give plenty of milk or water to drink. Get medical attention.
- Take labelled container with you to doctor.
- Take the information on Gramoxone in this booklet with you to doctor.

FOR PHYSICIAN: If swallowed, give stomach wash-out and test urine and gastric aspirate for paraquat. If positive, give up to 1 L of adsorbent suspension (30% Fuller's Earth, activated charcoal or amberlite resin) mixed with a purgative ($MgSO_4$, Na_2SO_4 or mannitol). Repeat administration of adsorbent suspension for the next 24 hours, plus purgative as required. Maintain and monitor electrolyte and fluid status daily. Consider haemodialysis or haemoperfusion using charcoal column. Delay oxygen as long as possible. If in eyes, treat symptomatically, using antibiotics and steroids as necessary. Emergency telephone numbers (416) 643-4123, 8:00 am – 4:45 pm. After hours (416) 528-6771 (state as calling for Chipman).

16. STORAGE: Gramoxone will crystallize if subjected to freezing temperatures. It therefore requires heated storage.

17. WHERE AVAILABLE: From major grain companies and many independent farm supply dealers, Midland Vegetation Control Inc.

Additional information available from:

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421

HERBEC 20P (tebuthiuron)

1. FORMULATIONS: 20% Pellets
   Available in 20 kg drums

2. REGISTERED MIXES: None registered

   Mix restrictions: Not applicable
   Mixing with other pesticides: Not recommended

3. CROPS: Areas where industrial brush control is required.

4. WEEDS CONTROLLED: Alder, balsam fir, birch, hard hack, pine, poplar, spruce (black, white), tamarack, willows.

5. WEEDS SUPPRESSED: Not applicable.

6. WHEN USED: Herbec 20P may be applied any time that the ground is not frozen or snow-covered; however, summer and fall applications will not control brush well into the next year.

7. HOW TO APPLY:

With:	Air or ground granular applicator
Rate:	6.88-8.9 kg/ac **(17-22 kg/ha)**
Water Volume:	Not applicable
Incorporation:	Not applicable
Pressure:	Not applicable
Ground Speed:	Not applicable
Nozzles:	Not applicable
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a respirator and goggles when opening drums of Herbec 20P.

8. SPRAYING TIPS:

   (a) Do not use on or near field crops, desirable trees or shrubs, on areas into which their roots may extend, or in locations where the chemical may be washed into contact with their roots, as injury or death may occur.
   (b) To get the best control, the granular applicator must be properly calibrated to distribute the pellets uniformly.

9. HOW IT WORKS: Herbec 20P must be taken up by the roots of the target species. It kills the plant by inhibiting photosynthesis. Herbec 20P is applied to the soil surface and is moved into the soil by rainfall. This product moves slowly downward into the soil and the rate of movement depends upon soil-type, amount of rainfall and environmental factors. Brush kill occurs when the Herbec 20P is brought into contact with the tree roots. Shallow-rooted brush species will be killed more quickly than deep-rooted species.

10. EXPECTED RESULTS: Herbec 20P will not provide rapid brush defoliation. Product applied in the summer and fall of one year will start to control bush later on in the following year. The speed of kill will depend upon the amount of rainfall, soil-type, environmental conditions and depth of rooting. Shallow rooting, sandy soil and high rainfall encourage more rapid kill. Some brush species may undergo repeated defoliation until completely killed. This complete kill may come as late as 24 to 36 months after application. Maximum brush control may be expected 24 months after application.

    Herbec 20P is specifically designed for the control of brush. Because Herbec 20P is a concentrated pellet and the number of pellets/ha is very low, the effect on ground cover is minimal.

    Conditions under which poor results may be expected:
    1. Application onto frozen ground.
    2. Improper rate.

11. EFFECTS OF RAINFALL: Moisture will carry Herbec 20P into the soil and bring it into contact with tree roots. Increased rainfall will increase the speed at which this product kills brush.

12. MOVEMENT IN THE SOIL: To be effective Herbec 20P must be leached into the root zone of the brush. Movement in the soil is vertical and not lateral. Depth of leaching rarely goes beyond 18 inches.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Not applicable
    Grazing Restrictionss: Do not graze land treated with Herbec 20P
    Crop Use After Hail: Not applicable
    Succeeding Crops: Herbec 20P is an industrial brush control product for use in areas where no agricultural crops are to be planted.

14. TOXICITY:

- has slightly high toxicity to mammals
  - oral LD_{50} rats = 644 mg/kg
  - oral LD_{50} mice = 579 mg/kg
- not a skin or eye irritant
- not toxic to cattle; slightly toxic to fish and birds
- no short-term or long-term human health problems have been associated with Herbec 20P

15. PRECAUTIONS AND FIRST AID: Avoid skin and eye contact when using all herbicides. Avoid breathing in dust when handling Herbec 20P.

16. STORAGE: Store in a dry area.

17. WHERE AVAILABLE: Able Vegetation Management, Ace Vegetation Control, Chipman Inc., Midland Vegetation Control, Molsberry Division of Reichold Chemical, Van Waters & Rogers.

Additional information available from:

Elanco
Division Eli Lilly Canada Inc.
Unit #3, 9829 – 44 Avenue
Edmonton, Alberta
T6E 5E6
Phone: (403) 436-7145

HERITAGE (trifluralin)

Wheat – Brown Soil Zones Only

1. FORMULATIONS: 5% Granular
   Available in 25 kg bags.

2. REGISTERED MIXES: None

3. CROPS: Spring wheat and durum varieties.

   Underseeding: Not recommended.

4. WEEDS CONTROLLED:

   Fallow Year: Wild millet (green foxtail), wild oats, Persian darnel, barnyard grass, wild buckwheat, cow cockle, lamb's-quarters, redroot pigweed and Russian thistle.

   Crop Year: Wild millet (green foxtail) and lamb's-quarters.

5. WEEDS SUPPRESSED:

   Fallow Year: None.

   Crop Year: Wild buckwheat. In the crop year some wild buckwheat may escape the herbicidal action of Heritage but its growth will be retarded and will result in limited competition to the wheat.

6. WHEN USED: Heritage should be applied to summerfallow fields between May 15 and August 15 for weed control during both years of the summerfallow wheat rotation. The maximum benefit from the use of Heritage in the Heritage wheat production system comes when Heritage is applied as early as possible in the fallow year.

7. HOW TO APPLY:

   With: Ground equipment. A properly calibrated granular herbicide applicator capable of applying Heritage granules accurately and uniformly is required.

   Rate: 8.9 kg/ac **(22 kg/ha)** between May 15 and July 1. 6.48 kg/ac **(16 kg/ha)** between July 1 and August 15. Heritage is recommended for the brown soil zones only.

   Water Volume: Not applicable.

   Incorporation: Heritage may be applied over standing stubble or pre-worked stubble provided the straw is chopped and evenly distributed over the soil surface. If green growth is heavy enough to prevent proper mixing, it must be destroyed before Heritage can be applied. Heritage must be incorporated within 24 hours of application by one Fallowblend™ operation. This operation is designed to mix the Heritage into the soil to a depth of 5-8 cm and should be done with a field cultivator, a deep tillage cultivator or a disc implement set to work 5-8 cm deep. Cultivators should be operated at 10-13 km/h and discs at 7-10 km/h. The second Fallowblend™ operation must be done at a different direction from the first and may be done whenever necessary to control resistant weed growth in the fallow year. One of the aforementioned implements set to a depth of 5-8 cm should be used for the second incorporation. After completing the two Fallowblend™ operations, additional operations with a rodweeder or shallow tillage cultivator may be required to control resistant weed growth. Heritage should not be blended with a cultivator when the soil is crusted, lumpy or too wet for good mixing action. Blending with implements set to cut deeper than 8 cm can result in erratic weed control and crop injury.

   Pressure: Not applicable.

   Ground Speed: Not applicable.

   Nozzles: Not applicable.

   Protective Equipment: Rubber gloves and goggles are recommended. In cases of prolonged contact in enclosed places, a Wilson R-25 cartridge respirator is recommended.

8. SPRAYING TIPS:

   (a) Heritage is part of a wheat fallow system and as such it is important to take into account the activities that occur in the fall of the crop year, the fallow (application year) and the crop year after fallow.
   (b) In the fall prior to Heritage application, set the combine straw chopper to spread straw evenly over the field surface and leave stubble standing over winter to trap snow. The straw must be spread uniformly enough so as not to interfere with the mixing of Heritage into the soil in the next spring.
   (c) If the green growth is heavy enough to interfere with soil mixing, it must be destroyed by tillage or a recommended herbicide before Heritage application in the spring.
   (d) Use a properly calibrated granular applicator that will apply Heritage uniformly.
   (e) To avoid overlapping or misses, use an implement mounted granular applicator or an applicator with a marking system.
   (f) Do not apply Heritage on soils subject to prolonged periods of flooding.
   (g) Do not apply Heritage to wet soil, soils in poor working condition or soils with more than 8% organic matter.
   (h) The maximum benefit from Heritage occurs when it is applied as soon after May 15 as practical.

(i) Blending with implements set to cut deeper than 8 cm may result in erratic weed control and crop injury.
(j) Heritage should not be blended with a cultivator when the soil is crusted, lumpy or too wet for good mixing action. No operation should be done deeper than the two Fallowblend™ operations.
(k) In the crop year, after Heritage application, seedbed preparation should be done with a field cultivator set to cut 5 cm deep when the soil is warm enough to promote good germination. Avoid transplanting weed seedlings.
(l) Seed into a weed-free seedbed using a double disc or hoe drill set to seed 4-8 cm deep. If a discer or air seeder is used, a separate spring tillage may not be necessary. The seed should be placed 5-8 cm deep and the soil should be packed or harrowed after seeding.
(m) Drought conditions in the fallow year prior to seeding may result in higher levels of Heritage in the soil when the crop is seeded. To reduce the possibility of injury in this situation, seed the crop 4-8 cm deep into a moist, warm seedbed.

9. HOW IT WORKS: To work effectively, Heritage must be uniformly mixed throughout the soil in the zone of weed seed germination since it acts on the growing points of the root and shoot as they emerge from the seed. Heritage inhibits cell division and actively growing points in the root and shoot. The effect on the roots is somewhat greater than the effect on the shoot.

The result of Heritage damage on weeds is death of the weed prior to emergence, since both root and shoot development are inhibited. Affected weeds have puffy, slow growing shoots that are extremely brittle. The lateral and secondary roots of affected seedlings are stunted and swollen at the tip. This shoot is extremely brittle. The root of affected plants show increased diameter near the tips and lateral and secondary root development is halted.

10. EXPECTED RESULTS: After the first Fallowblend™ operation, susceptible weeds will only be partially controlled. After the second Fallowblend™ operation, which is done at an angle to the first operation, susceptible weeds will be controlled by Heritage before they emerge from the soil. (Observation of Heritage treated weeds that do not emerge from the soil will show shoots and roots that are growing slowly, puffy in appearance, deformed and brittle to the touch.) In some cases the shoot of an affected plant may appear. Further investigation will show that the affected plant will have no secondary root system and the existing roots are swollen and deformed. These weeds generally die because the damaged root systems cannot supply adequate moisture needed when the increased temperature stresses the plant.

Crop Heritage will not injure wheat grown in rotation after summerfallow. However, over-application caused by overlapping, improper calibration or non-uniform application may result in a reduced crop stand, delayed development or reduced yields.

Conditions under which poor results may be expected:
1. Rate of chemical applied is below recommended level.
2. Improper incorporation of the chemical, namely, single incorporation, use of improper equipment or incorporation too shallow.
3. Incorporation on soils that are too wet, lumpy or trashy to allow for proper mixing.
4. Blending with implements set to cut deeper than 8 cm may result in erratic weed control and crop injury.

11. EFFECTS OF RAINFALL: Rainfall does not affect Heritage activity once incorporated into the soil.

12. MOVEMENT IN SOIL: Heritage is not leached in the soil.

13. GRAZING AND CROPPING RESTRICTIONS: None.

Crop Use After Hail: No restrictions.
Succeeding Crops: Heritage will not injure wheat grown in rotation after application on summerfallow.

14. TOXICITY:

Wildlife: Rat LD_{50} – 10,000 mg/kg.
Bees: Non-toxic.
Fish: In pure water, fish are extremley sensitive to Heritage. Under runoff conditions or in muddy water, the suspended soil binds Heritage very strongly and large amounts of Heritage can be tolerated by fish.

15. PRECAUTIONS AND FIRST AID: Harmful if swallowed or absorbed through the skin. Avoid contact with skin, eyes or clothing.

- If on skin, wash all exposed areas with soap and water. Wash all contaminated clothing before reuse.
- If in eyes, flush for 15 minutes with clean water and seek medical attention if irritation develops.
- If inhaled, move to fresh air if discomfort occurs. If breathing difficulty occurs, start mouth-to-mouth artificial respiration and contact a physician.
- If swallowed, induce vomiting and contact a physician immediately. Give at least 285 mL of water to children and 685 mL to adults. Make certain vomitus is not inhaled. After vomiting occurs give 30-40 mL of activated charcoal in a few millilitres of water.
- Take labelled container with you.

16. STORAGE: Store Heritage bags in areas not exposed to high temperatures, prolonged direct sunlight or moisture. Do not let product remain in the granular applicators under these conditions. After filling the granular applicator, close the lid immediately to avoid prolonged exposure to direct sunlight.

17. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain Company, Pioneer Grain, Federated Co-operatives and Van Waters & Rogers.

Additional information available from:

ELANCO
Division Eli Lilly Canada Inc.
Unit #3, 9829 – 44 Avenue
Edmonton, Alberta
T6E 5E3
Phone: (403) 436-7145 or (403) 436-7162

HOE-GRASS (diclofop-methyl)

1. FORMULATIONS: Emulsifiable concentrate containing 190 g/L
(present as methyl ester).
Available in 20 L containers.

2. REGISTERED MIXES: Hoe-grass + bromoxynil (Torch, Pardner)

Mixing with other pesticides: Not recommended.

3. CROPS: Winter, durum and spring wheat, barley (except Klages and Betzes), flax, rapeseed, tame mustard, field peas, lentils, tame buckwheat, spring rye, fall rye, triticale, dry common beans, fababeans, soybeans, sunflowers, potatoes, processing peas, onions (dry bulb), sugar beets, alfalfa*, clover (red and sweet)*, crested wheat grass, Russian wild rye grass*, creeping red fescue*, intermediate wheat grass*, seedling bromegrass*.

* year of establishment only

Tank-Mix: Hoe-Grass + Bromoxynil (Torch or Pardner) can be used on wheat, barley (except for varieties Klages and Betzes) and flax (apply when flax is 5-10 cm in height).

Tank-Mix: Hoe-Grass + Bromoxynil (Torch) can be used on seedling grasses grown for seed – bromegrass, crested wheat grass, intermediate wheat grass and Russian wild rye.

4. WEEDS CONTROLLED: Wild oats, yellow and green foxtail, barnyard grass, persian darnel and volunteer corn.

5. WEEDS SUPPRESSED: None

6. WHEN USED: 1-4 leaf stage of wild oats, green and yellow foxtail, barnyard grass. 1-3 leaf stage of persian darnel and a height of 15-25 cm for volunteer corn. Barley must be sprayed in the 1-4 leaf stage of the crop and prior to tillering or stooling.

7. HOW TO APPLY:

With:	Ground or aircraft equipment
Rate:	1.52 L/ac **(3.75 L/ha)**. One 20 L pail treats 13.6 ac at the 1.52 L/ac rate **(5.33 ha at the 3.75 L/ha rate)**
Water Volume:	Aircraft – minimum of 15 L/ac **(35 L/ha)** Ground – 40 L/ac **(100 L/ha)**
Incorporation:	Not applicable
Pressure:	Aircraft – 300 kPa, ground – 275 kPa
Ground Speed:	9 km/h
Nozzles:	Ground – use of 80° stainless steel flat fan nozzles is recommended for optimum spray coverage. Do not use flood jet nozzles.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

(a) Nozzles should be tilted 45° forward to ensure better coverage.
(b) When tank mixing with bromoxynil (Torch or Pardner) if grassy weed is in correct stage before broad-leaf weeds have emerged, do not delay Hoe-Grass applications.
(c) During periods of stress (for example very hot [28°C] and/or dry conditions, or very low humidity), plants are not actively growing. Application of Hoe-Grass during these periods may result in significantly reduced weed control. Even further reduction may be evident if using Hoe-Grass + Bromoxynil (Torch or Pardner) tank mix under these conditions than if Hoe-Grass is used alone.
(d) Do not mix Hoe-Grass with any other herbicides (except bromoxynil), insecticides, fungicides, fertilizers or any other chemicals or additives.
(e) Hoe-Grass must be applied before the use of any broad-leaf herbicide (except Torch or Pardner). A time interval of 4 days after application of Hoe-Grass is required to eliminate a reduction of grassy weed control.
(f) Do not use C.D.A. (Controlled Droplet Application) equipment as a reduction in grassy weed control will result.

9. HOW IT WORKS: Hoe-Grass possesses contact as well as systemic action. Uptake is primarily through the leaves. Penetration and uptake via roots is also possible, providing the soil is sufficiently moist and the rate of application is relatively high. The site of Hoe-Grass action is the growing point and thus the herbicide should be applied near this point by directing the spray 45° forward.

10. EXPECTED RESULTS: Yellowing of susceptible plants becomes noticeable within 2-4 days after application. New leaf growth exhibits lighter yellow blotches (chlorosis). The chlorosis deepens and browning develops within 10-14 days after application. At this point, photosynthesis and growth are inhibited and uptake of water and nutrients ceases.

Lack of adequate crown root development is one of the most distinguishable features of diclofop-methyl activity, and is evident on the wild oats as well as in some barley varieties, for which Hoe-Grass is not recommended.

Conditions under which poor results may be expected:
1. Rain within one hour of application.
2. Low rate of Hoe-Grass.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

3. Plants are under stress conditions.
4. Use of raindrop or flood-jet nozzles.
5. Tank mixes with insecticides, fertilizers or herbicides (other than Torch or Pardner) will reduce control.

Precautions: Barley – Hoe-Grass must be applied in the 1-4 leaf stage of the barley and prior to tillering. Application beyond the 4 leaf stage or after tillering (stooling) will result in crop damage. Under certain environmental conditions, yellow blotches may appear on the barley leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. DO NOT APPLY HOE-GRASS TO KLAGES OR BETZES BARLEY VARIETIES. Application of Hoe-grass on barley after recommended crop stage can contribute to lodging of the crop.

CAUTION: Application of Hoe-Grass MUST take place before tillering (stooling) of the grassy weeds. Poor weed control will result if application is made past tillering.

CAUTION: Good spray coverage is essential for optimum weed control especially in areas of heavy grassy weed populations.

11. EFFECTS OF RAINFALL: Rainfall within one hour will decrease activity.

12. MOVEMENT IN SOIL: Some movement in soil if sufficient moisture is present.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is low since only oats and corn are susceptible crops. Shelterbelts and gardens should not be damaged although direct contact should be avoided.
Grazing Restrictions: Do not graze treated green crop.
Succeeding Crops: No restriction.

14. TOXICITY:

- has very low acute toxicity to mammals
  - oral LD_{50} rats = 2,140 mg/kg
  - dermal LD_{50} rats = 5,000 mg/kg
- no short-term or long-term health problems have been associated with this product.
- toxic to fish; non-toxic to birds

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, flush for 15 minutes with clean water and seek medical attention.
- If swallowed, **do not induce vomiting** but rush person to nearest hospital.
- Take labelled container with you.

16. STORAGE: Do not store below freezing. If stored for one year or longer, shake well before using.

17. WHERE AVAILABLE: Pioneer Grain, Alberta Wheat Pool, Federated Co-operatives, United Grain Growers and Cargill Grain.

Additional information available from:

Hoechst Canada Inc.
295 Henderson Drive
Regina, Saskatchewan
S4N 6C2
Phone: (306) 924-1500

Hoechst Canada Inc.
#109, 2915 – 21 Street N.E.
Calgary, Alberta
T6E 6Z1
Phone: (403) 230-2294

"EXTRA STRENGTH" HOE-GRASS (diclofop-methyl)

1. FORMULATIONS: Emulsifiable concentrate containing 284 g/L
   (present as methyl ester).
   Available in 20 L containers.

2. REGISTERED MIXES: "Extra Strength" Hoe-grass + bromoxynil (Torch, Pardner).

   Mixing with other pesticides: Not recommended.

3. CROPS: Winter, durum and spring wheat, barley (except Klages and Betzes), flax, rapeseed, tame mustard, field peas, lentils, tame buckwheat, spring rye, fall rye, triticale, dry common beans, fababeans, soybeans, sunflowers, potatoes, processing peas, onions (dry bulb), sugar beets, alfalfa*, clover (red and sweet)*, crested wheat grass, Russian wild rye grass*, creeping red fescue*, intermediate wheat grass*, seedling bromegrass*.

   * year of establishment only

   Tank-Mix: "Extra Strength" Hoe-Grass + Bromoxynil (Torch or Pardner) can be used on wheat, barley (except for varieties Klages and Betzes) and flax (apply when flax is 5-10 cm in height).

   Tank-Mix: "Extra Strength" Hoe-Grass + Bromoxynil (Torch) can be used on seedling grasses grown for seed – bromegrass, crested wheat grass, intermediate wheat grass and Russian wild rye.

4. WEEDS CONTROLLED: Wild oats, yellow and green foxtail, barnyard grass, persian darnel and volunteer corn.

5. WEEDS SUPPRESSED: None

6. WHEN USED: 1-5 leaf stage of wild oats, green and yellow foxtail, barnyard grass. 1-3 leaf stage of persian darnel and a height of 15-25 cm for volunteer corn. Barley must be sprayed in the 1-4 leaf stage of the crop and prior to tillering or stooling.

7. HOW TO APPLY:

   With: Ground or aircraft equipment
   Rate: 1.01 L/ac **(2.5 L/ha)**. One 20 L pail treats 19.8 ac (7.1 ha) at the 1.1 L/ac **(2.5 L/ha)** rate. For control of wild oats in the 4-5 leaf stage, apply at 1.13 L/ac **(2.8 L/ha)**. When tank mixing with bromoxynil, use the 1.13 L/ac **(2.8 L/ha)** rate.
   Water Volume: Aircraft – minimum of 15 L/ac **(35 L/ha)**
   Ground – 40 L/ac **(100 L/ha)**
   Incorporation: Not applicable
   Pressure: Aircraft – 300 kPa, ground – 275 kPa
   Ground Speed: 9 km/h
   Nozzles: Ground – use of 80° stainless steel flat fan nozzles is recommended for optimum spray coverage. Do not use flood jet nozzles.
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

   (a) Nozzles should be tilted 45° forward to ensure better coverage.
   (b) When tank mixing with bromoxynil (Torch or Pardner) if grassy weed is in correct stage before broad-leaf weeds have emerged, do not delay Hoe-Grass applications.
   (c) During periods of stress (for example very hot [28°C] and/or dry conditions, or very low humidity), plants are not actively growing. Application of Hoe-Grass during these periods may result in significantly reduced weed control. Even further reduction may be evident if using Hoe-Grass + Bromoxynil (Torch or Pardner) tank mix under these conditions than if Hoe-Grass is used alone.
   (d) Do not mix Hoe-Grass with any other herbicides (except bromoxynil), insecticides, fungicides, fertilizers or any other chemicals or additives.
   (e) Hoe-Grass must be applied before the use of any broad-leaf herbicide (except Torch or Pardner). A time interval of 4 days after application of Hoe-Grass is required to eliminate a reduction of grassy weed control.
   (f) Do not use C.D.A. (Controlled Droplet Application) equipment as a reduction in grassy weed control will result.

9. HOW IT WORKS: Hoe-Grass possesses contact as well as systemic action. Uptake is primarily through the leaves. Penetration and uptake via roots is also possible, providing the soil is sufficiently moist and the rate of application is relatively high. The site of Hoe-Grass action is the growing point and thus the herbicide should be applied near this point by directing the spray 45° forward.

10. EXPECTED RESULTS: Yellowing of susceptible plants becomes noticeable within 2-4 days after application. New leaf growth exhibits lighter yellow blotches (chlorosis). The chlorosis deepens and browning develops within 10-14 days after application. At this point, photosynthesis and growth are inhibited and uptake of water and nutrients ceases.

    Lack of adequate crown root development is one of the most distinguishable features of diclofop-methyl activity, and is evident on the wild oats as well as in some barley varieties, for which Hoe-Grass is not recommended.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Conditions under which poor results may be expected:

1. Rain within one hour of application.
2. Low rate of Hoe-Grass.
3. Plants are under stress conditions.
4. Use of raindrop or flood-jet nozzles.
5. Tank mixes with insecticides, fertilizers or herbicides (other than Torch or Pardner) will reduce control.

Precautions: Barley – Hoe-Grass must be applied in the 1-4 leaf stage of the barley and prior to tillering. Application beyond the 4 leaf stage or after tillering (stooling) will result in crop damage. Under certain environmental conditions, yellow blotches may appear on the barley leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. DO NOT APPLY HOE-GRASS TO KLAGES OR BETZES BARLEY VARIETIES. Application of Hoe-grass on barley after recommended crop stage can contribute to lodging of the crop.

CAUTION: Application of Hoe-Grass MUST take place before tillering (stooling) of the grassy weeds. Poor weed control will result if application is made past tillering.

CAUTION: Good spray coverage is essential for optimum weed control especially in areas of heavy grassy weed populations.

11. EFFECTS OF RAINFALL: Rainfall within one hour will decrease activity.

12. MOVEMENT IN SOIL: Some movement in soil if sufficient moisture is present.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is low since only oats and corn are susceptible crops. Shelterbelts and gardens should not be damaged although direct contact should be avoided.
Grazing Restrictions: Do not graze treated green crop.
Succeeding Crops: No restriction.

14. TOXICITY:

- has very low acute toxicity to mammals
  oral LD_{50} rats = 2,140 mg/kg
  dermal LD_{50} rats = 5,000 mg/kg
- no short-term or long-term health problems have been associated with this product.
- toxic to fish; non-toxic to birds

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, flush for 15 minutes with clean water and seek medical attention.
- If swallowed, **do not induce vomiting** but rush person to nearest hospital.
- Take labelled container with you.

16. STORAGE: Do not store below freezing. If stored for one year or longer, shake well before using.

17. WHERE AVAILABLE: Pioneer Grain, Alberta Wheat Pool, Federated Co-operatives, United Grain Growers and Cargill Grain.

Additional information available from:

Hoechst Canada Inc.
295 Henderson Drive
Regina, Saskatchewan
S4N 6C2
Phone: (306) 924-1500

Hoechst Canada Inc.
#109, 2915 – 21 Street N.E.
Calgary, Alberta
T6E 6Z1
Phone: (403) 230-2294

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

HOE-GRASS II (diclofop-methyl/bromoxynil)

1. FORMULATIONS: Emulsifiable concentrate containing 230 g/L of diclofop-methyl (present as methyl ester) and 80 g/L of bromoxynil (present as the ester of N-octanoic acid).

2. REGISTERED MIXES: Mixing with any pesticide, fertilizer, or chemical additive is *not* recommended.

3. CROPS: Durum and spring wheat, barley (do not apply to 2-row varieties in Alberta), flax, (apply when flax is 5-10 cm in height). Do not treat crops underseeded to forage legumes.

4. WEEDS CONTROLLED: Wild oats, yellow and green foxtail, barnyard grass, persian darnel, volunteer corn, wild buckwheat, Tartary buckwheat, lady's thumb, green smartweed, kochia, common groundsel, knawel, night flowering catchfly, cow cockle, wild mustard, scentless chamomile, stinkweed, lamb's-quarters, redroot pigweed, Russian thistle.

5. WEEDS SUPPRESSED: None

6. WHEN USED: 1-4 leaf stage of wild oats, green and yellow foxtail, and barnyard grass. 1-3 leaf stage of persian darnel and a height of 15-25 cm for volunteer corn. Broadleaved weeds are controlled from seedling to early 4 leaf stage (except for Russian thistle where the stage is seedling to 5 cm in height).

7. HOW TO APPLY:

   With: Ground equipment only. Do not apply by air.
   Rate: 1.42 L/ac **(3.5 L/ha)**. One 20 L pail treats 14.1 ac (5.7 ha).
   Water Volume: 45 L/ac **(110 L/ha)**
   Incorporation: Not applicable
   Pressure: 275 kPa. Add 35 kPa if your spray tips have check valves.
   Ground Speed: 6-8 km/h
   Nozzles: Use of 80° stainless steel flat fan nozzles is recommended for optimum spray coverage. Do not use flood jet nozzles or controlled droplet application equipment.
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus protective eye equipment.

8. SPRAYING TIPS:

   (a) Nozzles should be tilted 45° forward to ensure better coverage.
   (b) For best results and maximum yield enhancement, apply Hoe-Grass II early, when the majority of the weeds are in the 2-3 leaf stage. If uneven weed seedling germination exists, consult your local weed specialist for the best method of weed control.
   (c) During periods of stress (for example very hot [28°C] and/or dry conditions, or very low humidity), plants are not actively growing. Application of Hoe-Grass II during these periods may result in significantly reduced weed control.
   (d) Do not mix Hoe-Grass II with any other pesticide, fertilizers or other chemicals or additives.
   (e) Hoe-Grass II must be applied before the use of any other herbicide. A time interval of 4 days after application of Hoe-Grass II is required to eliminate a reduction of control.
   (f) Do not treat wheat, barley, or flax underseeded to forage legumes.

9. HOW IT WORKS: Because of the two different active ingredients in Hoe-Grass II, each possesses its own mode of activity for its susceptible weed species.

   Diclofop-methyl possesses contact as well as systemic action. Uptake is primarily through the leaves. The site of diclofop-methyl action is the growing point and thus the herbicide should be applied near this point by directing the spray 45° forward. Bromoxynil is primarily a contact herbicide with limited translocative active for susceptible annual broadleaved weeds. It has been shown to inhibit plant photosynthesis and respiration.

10. EXPECTED RESULTS: Yellowing of diclofop-methyl susceptible plants becomes noticeable within 2-4 days after application. New leaf growth exhibits lighter yellow blotches (chlorosis). The chlorosis deepens and browning develops within 10-14 days of application. At this point, photosynthesis and growth are inhibited and uptake of water and nutrients ceases. Lack of adequate crown root development is one of the most distinguishable features of diclofop-methyl activity.

    Bromoxynil activity is visually evident within 24 hours as necrotic spots on the leaves of susceptible broadleaved weeds. This damage spreads rapidly until the plants ultimately die. Chlorosis may develop in the untreated leaves of these susceptible weeds even though very little movement of the bromoxynil occurs.

    Conditions under which poor results may be expected:
    1. Rain within one hour of application.
    2. Low rates used.
    3. Plants are under environmental stress (ex. drought, etc.).
    4. Use of raindrop or flood-jet nozzles.
    5. Tank mixes with insecticides, fertilizers or herbicides.
    6. Improper plant leaf stages at time of application will result in poor control.

*******LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE******

Precautions: Barley – Hoe-Grass II must be applied in the 1-4 leaf stage of the barley and prior to tillering or stooling. Application beyond the 4 leaf stage or after tillering will result in crop damage. Under certain environmental conditions, yellow blotches may appear on the barley leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. DO NOT APPLY TO TWO-ROW BARLEY VARIETIES IN ALBERTA. Flax – Hoe-Grass II must be applied when the flax is 5-10 cm in height. During periods of stress [for example, very hot (28° C) and/or humid weather], flax may show leaf burn, retarded growth and a slight maturity delay. Avoid spraying flax under these conditions.

CAUTION: Good spray coverage is essential for optimum weed control especially in areas of heavy weed populations.

11. EFFECTS OF RAINFALL: Rainfall within one hour will decrease activity.

12. MOVEMENT IN SOIL: Some movement may occur if sufficient moisture is present.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Avoid treatment near susceptible crops such as corn, oats, rapeseed, etc. or shelterbelts and gardens as damage could occur.
Grazing Restrictions: Do not graze treated field prior to harvest. Do not use treated field for green forage. Do not apply Hoe-Grass II within 60 days of harvest.
Succeeding Crops: No restriction.

14. TOXICITY: While Hoe-Grass II is a safe product to handle, contact with eyes, skin or clothing should be avoided. Hoe-Grass II is toxic to fish. Do not contaminate water supplies, irrigation ditches, ponds, lakes or streams.

oral LD_{50} rats = 2,350 mg/kg
dermal LD_{50} rabbit = mild irritant
LC_{50} 4 day, rainbow trout = 1.0 mg/kg
eye irritation, rabbit = mild ocular irritant

15. PRECAUTIONS AND FIRST AID: Avoid contact with eyes, skin or clothing. Avoid breathing spray mist. Use of protective eye equipment is highly recommended.

- If on skin, remove contaminated clothing and wash skin thoroughly with soap and water.
- If in eyes, flush for 15 minutes with clean water and seek medical attention.
- If swallowed, **do not induce vomiting** but rush person to nearest hospital.
- Take labelled container with you.

16. STORAGE: Do not store below freezing. If stored for one year or longer, shake well before using.

17. WHERE AVAILABLE: Alberta Wheat Pool, Pioneer Grain, United Grain Growers, Federated Co-operatives and Cargill Grain.

Additional information available from:

Hoechst Canada Inc.
295 Henderson Drive
Regina, Saskatchewan
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Phone: (306) 924-1500

Hoechst Canada Inc.
109, 2915 – 21 Street, N.E.
Calgary, Alberta
T2E 6Z1
Phone: (403) 230-2294

HYVAR X (bromacil)

1. FORMULATIONS: 80% wettable powder
   Available in 25 kg drum; 2 kg bag

   Water soluble liquid: 240 g/L (Hyvar X L)
   Available in 4 L and 10 L containers

2. REGISTERED MIXES: None

3. CROPS: Non-crop land only. This is an industrial herbicide, used for total vegetation control.

4. WEEDS CONTROLLED: Hyvar X is a non-selective, total vegetation control chemical which controls most annual and perennial weeds: such as, crabgrass, dandelion, foxtail, pigweed, quackgrass, ragweed, wild carrot. Brush species controlled are: alder, maple, aspen poplar, ash, balsam poplar, sumac, oak, cherry, elm, hawthorn.

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Apply Hyvar X or Hyvar X L just before or during the active growth period of weeds for best results. Sufficient moisture from rainfall or artificial means is necessary following treatment to carry the chemical to the root zone of weeds.

7. HOW TO APPLY:

A) Hyvar X L

With: A fixed boom sprayer calibrated to apply a constant output at constant speed. Handguns, backpack sprayers or a watering can, may be used to treat smaller areas.

Rate:

(i) Initial treatment to control weeds on non-cropland areas such as railway, highway and pipeline rights-of-way, tank farms, lumber yards and industrial and storage areas. Apply 12.14-18.21 L/ac **(30-45 L/ha)**. Use the higher dosage on soils containing 5% or more organic matter, or soils high in clay content.
(ii) Retreatment to control weeds and grasses such as alfalfa, bluegrass, mullein or aster when they reappear following treatment. Apply 5.88-8.9 L/ac **(17-22 L/ha)**.
(iii) For small areas apply in adequate water to obtain thorough coverage. Apply 450 mL on 100 sq. m. OR 45 mL on 10 sq. m.
(iv) Brush Control
Undiluted Spot Treatment – apply undiluted with an exact delivery handgun applicator: this equipment delivers a thin stream of a predetermined volume.
One 8 mL deposit directed at the base of brush up to 1 m tall (root collar area).
Two 8 mL deposits on opposite side of brush up to 2 m tall.
Three 8 mL deposits around the root collar area of brush up to 3 m tall.
Four or five 8 mL deposits around the root collar area of taller brush.
An extra deposit will be required to control ash.
Undiluted Grid Treatment – for large areas requiring non-selective brush control apply 8 mL on a 1.0-1.2 m grid.
Diluted Spot or Grid Treatment – mix 1 L of Hyvar X L in 5 L of water. Using a backpack or larger equipment apply as above, using 55 mL rather than 8 mL deposits.

B) Hyvar X

With: Same type of equipment as described for the application of Hyvar X L, except efficient agitation of the spray solution is required.

Rate:

(i) Initial treatment to control weeds in non-cropland areas as described under Hyvar X L. Apply 3.14-5.46 kg/ac **(7.75-13.5 kg/ha)**.
Use the higher dosage on soils containing 5% or more organic matter, or soils high in clay content.
(ii) Retreatment when weeds and grasses reappear following treatment. Apply 1.32-2.73 kg/ac **(3.25-6.75 kg/ha)**.
(iii) For small areas apply in adequate water to obtain thorough coverage. Apply 135 g on 100 sq. m.
(iv) Brush Control
Mix 870 g Hyvar X in 10 L of water and apply 30-60 mL/stem 5-10 cm in basal diameter. Wet base of stem to run off.

Water Volume: For application of Hyvar X L with a handgun apply 650 L of spray solution/ac **(1,600 L of spray solution/ha)**. For application of Hyvar X use a minimum of 20 L of water/kg of Hyvar X.
Incorporation: Not applicable
Pressure: Not restricted
Ground Speed: Not restricted

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a respirator and goggles when opening drums or bags of Hyvar X.
- plus a face shield and apron when opening containers of liquid concentrate of Hyvar X L.

8. SPRAYING TIPS:

(i) Hyvar X L
(a) Before spraying: calibrate equipment to determine the quantity of water necessary to uniformly cover the measured area to be treated.
(b) After Hyvar X L has been thoroughly mixed in the spray tank, agitation of the spray solution is not required.
(c) Hyvar X L is corrosive to aluminum. Do not use aluminum equipment, tanks, pipes or nozzles.
(d) Do not drain or flush equipment near desirable vegetation or trees or where it may come into contact with the roots of desirable trees or vegetation. A minimum safe interval is one and one half times the height of the tree away from the trunk.
(e) Clean all traces of Hyvar X L from the equipment before using it for any other purpose. Remove nozzle tips and screens and rinse thoroughly and flush the tank, pump, hoses and boom with several changes of water.

(ii) Hyvar X
(a) Before spraying; calibrate equipment to determine the quantity of water necessary to uniformly cover the measured area to be treated.
(b) Material must be kept in suspension by continuous agitation.
(c) Openings in screens should be no smaller than 50 mesh.
(d) If a by-pass or return line is used, it should terminate at the bottom of the tank to minimize foaming, and do not use air agitation.
(e) Do not apply when the ground is frozen.
(f) Do not drain or flush equipment near desirable vegetation or trees or where it may come into contact with the roots of desirable trees or vegetation. A minimum safe interval is one and one half times the height of the tree away from the trunk.
(g) Clean all traces of Hyvar X L from the equipment before using it for any other purpose. Remove nozzle tips and screens and rinse thoroughly and flush the tank, pump, hoses and boom with several changes of water.

9. HOW IT WORKS: Hyvar X is readily absorbed through the plant root systems and much less readily absorbed through the leaves. Once within the plant it inhibits photosynthesis.

10. EXPECTED RESULTS: Susceptible plants become chlorotic soon after treatment and then die. Speed of action will be influenced by the volume of rainfall.

Conditions under which poor results may be expected:
1. Inadequate application rate.
2. Weed growth too mature.
3. Insufficient rainfall.
4. Application on areas subject to severe soil erosion.
5. Application too near feeding roots of susceptible vegetation.

11. EFFECTS OF RAINFALL: Rainfall will activate the chemical, carrying it rapidly into the root zone where it will kill susceptible weeds and brush.

12. MOVEMENT IN SOIL: Movement in the soil is dependent upon soil type and soil moisture. Bromacil will move more rapidly in a vertical direction in sandy soils than in soils high in organic matter or clay content.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: All crops and ornamentals may be injured by chemical drift. The extent of the injury is dependent upon the volume of chemical falling upon the desirable plant.
Grazing Restrictions: Not applicable
Crop Use After Hail: Not applicable
Succeeding Crops: Hyvar X is a non-selective residual herbicide. It should only be used on non-crop land where long term bare ground is desired.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 5,200 mg/kg
- no short-term or long-term human health problems have been associated with Hyvar
- toxic to fish (LC_{50} 48 hours = 71 ppm)

15. PRECAUTIONS AND FIRST AID: Avoid contact of skin and eyes, and do not inhale spray mist.

- If on skin, wash with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If Hyvar X L is swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Hyvar X – Store in a cool dry place.
Hyvar X L – Combustible, keep away from heat or open flame. Do not allow to freeze.

17. WHERE AVAILABLE: Able Industries, Ace Vegetation Control, Allied Chemical Services, Cargill Grain, Molsberry-Division of Reichhold Chemical, Oliver Agricultural Supply, Pfizer Chemical Dealers, Pioneer Grain, United Farmers of Alberta, Westcan Horticultural Specialists Ltd., Midland Vegetation Control Inc.

Additional information available from:

DuPont Canada Inc.
#105, 333 – 25 Street E.
Saskatoon, Saskatchewan
S7K OL4
Phone: (306) 244-4511

KARMEX (diuron)

1. FORMULATIONS: 80% wettable powder
   Available in 25 kg drums, and 2 kg bags.
2. REGISTERED MIXES: None
3. CROPS: Asparagus, irrigation and drainage ditches and spot treatment for general weed control. Non-crop areas to control annual and perennial weeds and grasses such as pigweed, dandelion, golden rod, milkweed, and Russian thistle.
4. WEEDS CONTROLLED: Weed seedlings such as pigweed, ragweed, lamb's-quarters, and grasses such as crab grass and foxtail.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Karmex may be used at any time, except when the ground is frozen. Sufficient moisture from rainfall or artificial means is necessary following chemical treatment to carry the chemical to the root zone of the weeds.
7. HOW TO APPLY:

With: A fixed boom sprayer, calibrated to apply a constant output at constant speed. A small tank type hand sprayer, back-pack type sprayer or sprinkling can, may be used to treat smaller areas.

Rate:

(i) General Weed Control:
Apply 5.67-10.93 kg/ac **(14.0-27.0 kg/ha)** Karmex on sand or sandy soils.
Apply 16.19-22.26 kg/ac **(40.0-55.0 kg/ha)** Karmex on clays or high organic soils.
Use the lower rate in the respective soil zone when annual weed growth predominates and where only one season's control is desired.

(ii) **Retreatment:**
When regrowth begins again following a treatment, apply 0.45 kg/ac **(1.1 kg/ha)** of Karmex to control seedling annuals.

(iii) **Irrigation and Drainage Ditches**
Apply 0.25-0.75 kg/100 sq. m. 10.18-30.35 kg/ac **(25.0-75.0 kg/ha)** Apply during the non-crop season when the ditch is not in use. Flush once before using for irrigation purposes. Karmex must be fixed in the soil by moisture to minimize movement in irrigation water.

(iv) **Spot Treatment**
Spot treat at 0.75-1.0 kg/100 sq. m. 30.85-40.47 kg/ac **(75.0-100.0 kg/ha)** to control couch grass and toadflax. A rate of 50 g of Karmex applied on 10 sq. m. is equal to 20.23 kg/ac **(50 kg/ha)**.

Water Volume: Use a minimum of 20 L of water/kg of Karmex.
Incorporation: Not applicable
Pressure: Not restricted
Ground Speed: Not restricted
Nozzles: Not restricted
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a respirator and goggles when opening bags or drums of Karmex.

8. SPRAYING TIPS:

(a) Before beginning to spray calibrate the equipment to determine the quantity of water necessary to uniformly cover the measured area to be treated.
(b) Material must be kept in suspension by continuous agitation.
(c) Screen openings should be no smaller than 50 mesh.
(d) Use mechanical or hydraulic means of agitating the mixture in the spray tank.
(e) If a by-pass or return line is used, it should terminate at the bottom of the tank to minimize foaming.
(f) Do not use air agitation.
(g) Do not apply when the ground is frozen.
(h) Do not apply in any area where bare ground is undersirable.
(i) Do not drain or flush equipment near desirable vegetation or trees or where it may come into contact with the roots of desirable trees or vegetation. A minimum safe interval is one and one half times the height of the tree away from the trunk.
(g) Clean all traces of Karmex from the equipment before using it for any other purpose. Remove nozzle tips and screens and rinse thoroughly and flush the tank, pump, hoses and boom with several changes of water.

9. HOW IT WORKS: Diuron is readily absorbed through the root system and less readily absorbed through stem and foliage. It is translocated upward, primarily in the xylem system and acts as an inhibitor of photosynthesis.
10. EXPECTED RESULTS: Susceptible plants become chlorotic soon after treatment and then die. Speed of action will be influenced by the rainfall.

Conditions under which poor results may be expected:
1. Inadequate application rate.
2. Weed growth too mature.
3. Insufficient rainfall.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

4. Application on areas subject to severe soil erosion.
5. Application too near feeding roots of susceptible vegetation.

11. EFFECTS OF RAINFALL: Rainfall will activate the chemical, carrying it rapidly into the root zone where it will kill susceptible weeds and brush.

12. MOVEMENT IN THE SOIL: Diuron leaches downward very readily, particularly in sandy soil low in organic matter.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: All crops and ornamentals may be injured by chemical drift. The extent of the injury is dependent upon the volume of chemical falling upon the desirable plant.
Grazing Restrictions: Not applicable
Crop Use After Hail: Not applicable
Succeeding Crops: Karmex is a non-selective residual herbicide. It should only be used on non-crop land where long term bare ground is desired.

14. TOXICITY:

- has very low acute toxicity to mammals
  oral LD_{50} rats = 3,400 mg/kg
- **long-term continuous exposure to Karmex may cause spleen enlargement**
- non-toxic to birds and fish

15. PRECAUTIONS AND FIRST AID: Avoid exposure to Karmex as much as possible. Do not breathe in spray mist.

- If on skin, wash off immediately with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.

16. STORAGE: Store in a cool dry place.

17. WHERE AVAILABLE: Able Industries, Ace Vegetation Control, Molsberry-Division of Reichhold Chemical, Midland Vegetation Control Inc.

Additional information available from:

DuPont Canada Inc.
#105, 333 – 25 Street E.
Saskatoon, Saskatchewan
S7K OL4
Phone: (306) 244-4511

KERB 50-W (propyzamide)
(Forage Crops)

1. FORMULATIONS: 50% wettable powder
   Available in 2.0 kg bags

2. REGISTERED MIXES: None specified

3. CROPS: First year and established plantings of alfalfa and bird's-foot trefoil.

4. WEEDS CONTROLLED: Annual grasses (including volunteer grain and wild oats), chickweed, orchard grass, quackgrass, timothy, wild barley (foxtail barley).

5. WEEDS SUPPRESSED: None

6. WHEN USED: Fall application – alfalfa, bird's-foot trefoil.
   Spring application – alfalfa seed crops.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	0.71 kg/ac **(1.75 kg/ha)** – Annual grasses, volunteer grain, wild oats (fall or spring application) 0.91-1.32 kg/ac **(2.25-3.25 kg/ha)** – Quackgrass, orchard grass, timothy, chickweed (fall appliation only)
Water Volume:	40-200 L/ac **(100-500 L/ha)**
Incorporation:	Spring application on alfalfa seed crops – if soil temperature is high and moisture content is low at time of application, a light incorporation is recommended.
Pressure:	Standard low pressure (275 kPa)
Ground Speed:	8 km/h
Nozzles:	Flat fan nozzles delivering 40-200 L/ac **(100-500 L/ha).**
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a respirator and goggles when opening containers of Kerb 50-W.

8. SPRAYING TIPS:

   Fall Application: Timing depends on soil temperature and ground freezing. Best results are obtained when soil temperature is low but above freezing, and soil moisture is high. Surface applications are most effective if followed by rain in a day or two or a light overhead irrigation (1.25-2.5 cm).

   Spring Application: Soil temperature should be cool for optimum control.

9. HOW IT WORKS: Kerb 50-W acts through root absorption.

10. EXPECTED RESULTS: Not specified

11. EFFECTS OF RAINFALL: See "Spraying Tips".

12. MOVEMENT IN SOIL: Not specified

13. GRAZING AND CROPPING RESTRICTIONS:

    Grazing Restrictions: Do not harvest or graze within 90 days after application of 1.32 kg/ac **(3.25 kg/ha)** of Kerb 50-W or 60 days after rates of less than 1.32 kg/ac **(3.25 kg/ha).**
    Succeeding Crops: To avoid injury to subsequent crops in the rotation, wait 9 months before planting other crops in Kerb treated crop.

14. TOXICITY:

    – has very low acute mammalian toxicity
      oral LD_{50} rats = 8,350 mg/kg
    – no short-term or long-term health problems have been associated with Kerb 50-W

15. PRECAUTIONS AND FIRST AID: Avoid breathing dust or spray mist.
    Avoid getting Kerb 50-W on skin or in eyes.

    – In on skin, wash off with soap and water.
    – If in eyes, wash for 15 minutes.

16. STORAGE: Store in a cool, dry place.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE: Alberta Wheat Pool, Oliver Agricultural Supply, Chipman Inc.

Additional information available from:

Rohm and Haas Canada Inc.
Prairies Regional Office
Suite #17, 830 King Edward St.
Winnipeg, Manitoba
R3H OP5
Phone: (204) 774-1755

Rohm and Haas Canada Inc.
18 Oakbury Place, S.W.
Calgary, Alberta
T2V 4A2

Phone: (403) 281-0831

KERB 50-W (propyzamide)
(Pastures)

1. FORMULATIONS: 50% wettable powder
   Available in 2.0 kg bags
2. REGISTERED MIXES: None specified
3. CROPS: Established pastures, grass, or grass/legume (alfalfa, bird's-foot trefoil) pastures.
4. WEEDS CONTROLLED: Wild barley (foxtail barley). Kerb selectively kills wild barley in pasture grass stands.
5. WEEDS SUPPRESSED: None
6. WHEN USED: Fall Application **Only.**
7. HOW TO APPLY:

Note: Refer to "Specific Application Instructions" below.*

With:	Ground Equipment
Rate:	Apply 0.36 kg/ac **(0.9 kg/ha)** of Kerb 50-W on brown, dark brown and grey wooded soils and 0.45 kg/ac **(1.1 kg/ha)** on thin black and black soil zones. One 2 kg bag treats 4.45-5.43 ac (1.8-2.2 ha).
Water Volume:	40-200 L/ac **(100-500 L/ha)**
Incorporation:	None
Pressure:	Standard low pressure (275 kPa)
Ground Speed:	8 km/h
Nozzles:	Flat fan nozzles
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a respirator and goggles when opening containers of Kerb 50-W.

* SPECIFIC APPLICATION INSTRUCTIONS – PASTURELAND USE

Kerb 50-W:

Do not apply Kerb 50-W on high organic matter peat or muck soils.

Spray overlaps may seriously harm desirable pasture grass species.

Kerb 50-W must be applied in the fall between October 1 and freeze-up.

Do not use Kerb 50-W on desired stands of Timothy and Fescue grass species.

Kerb 50-W is a root-absorbed herbicide and moisture from snow melt carries the herbicide into the root zone of foxtail barley and kills the weed and germinating seedlings when they begin to grow in the spring.

At the recommended rates of use, pastures stands of perennial bluegrass species may be reduced by 10-20%; however, rejuvenation will occur quickly during the growing season.

Do not use Kerb 50-W for foxtail barley removal in seed grass stands.

Only 50 mesh or larger metal filters and mozzle screens should be used.

8. SPRAYING TIPS: Timing depends on soil temperature and ground freezing. Best results are obtained when soil temperature is low but above freezing, and soil moisture is high.
9. HOW IT WORKS: Kerb 50-W acts through root absorption.
10. EXPECTED RESULTS: Not specified
11. EFFECTS OF RAINFALL: Rainfall moves the herbicide into the root zone of foxtail barley for better control.
12. MOVEMENT IN SOIL: Not specified
13. GRAZING AND CROPPING RESTRICTIONS:

Grazing Restrictions: Do not harvest or graze within 90 days after application of 1.32 kg/ac **(3.25 kg/ha)** of Kerb 50-W or 60 days after rates of less than 1.32 kg/ac **(3.25 kg/ha).**
Succeeding Crops: To avoid injury to subsequent crops in the rotation, wait 9 months before planting other crops in Kerb treated soil.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 8,350 mg/kg
- no short-term or long-term human health problems have been associated with this product

15. PRECAUTIONS AND FIRST AID: Avoid breathing dust or spray mist.
Avoid getting Kerb 50-W on skin or in eyes.

- If on skin, wash off with soap and water.
- If in eyes, flush for 15 minutes.

16. STORAGE: Store in a cool, dry place.

17. WHERE AVAILABLE: Alberta Wheat Pool, Oliver Agricultural Supply, Chipman Inc.

Additional information available from:

Rohm and Haas Canada Ltd.
Prairies Regional Office
Suite #17, 830 King Edward St.
Winnipeg, Manitoba
R3H OP5
Phone: (204) 774-1755

Rohm and Haas Canada Ltd.
18 Oakbury Place, S.W.
Calgary, Alberta
T2V 4A2

Phone: (403) 281-0831

KIL-MOR (2,4-D + mecoprop + dicamba)

1. FORMULATIONS: Water soluble solution containing 310 g/L 2,4-D,
   80 g/L mecoprop + 110 g/L dicamba.
   Available in 10 L containers.

2. REGISTERED MIXES: Kil-Mor 45 mL/ac **(1.1 L/ha)** + Atrazine 80 W 0.710 kg/ac **(1.75 kg/ha)** in corn.

3. CROPS: Spring (including durum) and winter wheat, oats, barley, sweet and field corn.

   Underseeding: Not recommended

4. WEEDS CONTROLLED:

   In crops: Bindweed (hedge), buckwheat (wild), cocklebur, corn spurry, cow cockle, flax, flixweed, knotweed, lamb's-quarters, mustards, peppergrass, pigweed (prostrate and redroot), Russian thistle, shepherd's-purse, smartweeds (annual), sow-thistle (annual), stinkweed, Tartary buckwheat, lady's-thumb.

   Along roadsides: Alders, bull thistle, chicory, goat's-beard, poison ivy, ragwort, white cockle.

5. WEEDS SUPPRESSED: Field bindweed, Canada thistle, cleavers.
   Gradual eradication of Canada thistle (consult the label)

   1. Cultivated Fields 2. Summerfallow Fields

6. WHEN USED:

   Spring wheat – 3-5 leaf stage.
   Winter wheat – in spring before crop is 30 cm high
   Oats – 3-4 leaf stage
   Barley – 2-3 leaf stage
   Corn – Overall spray prior to 15 cm height of corn, use drop nozzles after 15 cm height
   Roadsides – In spring when weeds are growing actively
   Weed growth stage – 2-5 leaf stage
   NOTE: Treatment at other than recommended crop stage may cause injury.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	Spring wheat – 0.34-0.45 L/ac **(0.85-1.1 L/ha)** Winter wheat – 0.34-0.45 L/ac **(0.85-1.1 L/ha)** Oats – 0.34-0.45 L/ac **(0.85-1.1 L/ha)** Barley – 0.34 L/ac **(0.85 L/ha)** Sweet corn – 0.34-0.45 L/ac **(0.85-1.1 L/ha)** Roadsides – 1.32 L/ac **(3.25 L/ha)** At 0.34 L/ac **(0.85 L/ha)** rate, one 4 L container will treat 11.6 ac (4.7 ha) Summerfallow – 0.45-0.71 L/ac **(1.1-1.75 L/ha)**
Water Volume:	40 L/ac **(100 L/ha)**
Incorporation:	Not applicable
Pressure:	Sufficient to ensure complete coverage
Ground Speed:	Sufficient to ensure complete coverage
Nozzles:	All standard and low pressure nozzles delivering recommended volume.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

   (a) Barley is the most sensitive crop to Kil-Mor. Ensure that proper rate, water volume and timing is used otherwise, crop injury may occur.
   (b) Risk of crop injury increases as water volume drops below 36 L/ac **(90 L/ha)**.

9. HOW IT WORKS: Kil-Mor is a combination of three systemic hormonal herbicides which accummulate in the growing points of susceptible plants and produce abnormal growth resulting in the disruption of the transport system in plants. Movement to these growing points is slow.

10. EXPECTED RESULTS:

    Weeds: Due to the slow translocation of the chemical in the plant and the influence of growing conditions, effect on weeds becomes visible within 7-14 days after spraying – leaves curl, leaf petioles twist, leaf edges turn brown, whole plant ceases growth and eventually turns brown and dies.

    Crop: Improper applications can result in abnormal bending at the internodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels and sterile florets.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Conditions under which poor results may be expected:

1. Inadequate coverage.
2. Rainfall shortly after application.
3. Weeds overmature.

11. EFFECTS OF RAINFALL: Do not spray if rain is expected within 4 hours.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Tomatoes, sugar beets, sunflowers, beans, turnips, cauliflower, cabbage, ornamentals and fruit crops are very sensitive to drift.
Grazing Restrictions: No haying or grazing restrictions at recommended rate.
Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- Kil-Mor has low acute mammalian toxicity
  oral LD_{50} rats = 1,028 mg/kg
- **mecoprop has potential to produce enlarged kidneys after long-term continuous exposure**
- 2,4-D in formulation contains no dioxin
- non-toxic to fish
- LD_{50} of dicamba to bees = 3.6 micrograms/bee

15. PRECAUTIONS AND FIRST AID: Avoid prolonged continuous exposure of any kind to Kil-Mor. Do not get on skin or in eyes, and do not inhale spray mist.

- If on skin, wash off immediately.
- If in eyes, flush for 15 minutes and see a doctor.
- If swallowed, induce vomiting. Give plenty of milk or water to drink. Get medical attention.
- Take labelled container to doctor.

Some symptoms of over-exposure to Kil-Mor are: loss of appetite, vomiting, depression, general tenseness and muscular weakness.

16. STORAGE: Heated storage only.

17. WHERE AVAILABLE: Green Cross Product Dealers.

Additional information available from:

Green Cross Products
820 – 26 Street N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

KRENITE (fosamine)

1. FORMULATIONS: A water soluble liquid containing 480 g of the ammonium salt of fosamine. Available in 10 L containers.

2. REGISTERED MIXES: Krenite + a non-ionic surfactant.

3. CROPS: Non-crop land only. Use on areas where industrial brush control is required.

4. WEEDS CONTROLLED: Oak, maple, alder, hazel, ash, elm, birch, trembling aspen, beech and pine. The highest recommended application rate may be needed to control large tooth aspen, wild cherry, hemlock, white spruce and balsam fir.

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Krenite is applied to brush at any time from mid-June to late September.

7. HOW TO APPLY:

With: Ground equipment capable of applying a fairly substantial volume of spray to cover the brush to be treated.
Rate: Use 10.0-15.0 L/1,000 L of water and add 1-2 L of surfactant to the mixture.
Water Volume: Apply 200-1,200 L of spray solution/ac **(500-3,000 L of spray solution/ha)**. Volume of spray solution required depends upon height, density and species of brush.
Incorporation: Not applicable
Pressure: Not restricted
Ground Speed: Not restricted
Nozzles: Not restricted
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

(a) Do not apply to food crops.
(b) Do not allow drift or spray mist to contact desirable trees, shrubs or other plants as injury may result.
(c) Do not contaminate any body of water.
(d) Carefully measure the proper amount of Krenite and, while using agitation, thoroughly mix with the proper volume of water.
(e) The addition of a non-ionic surfactant is required to control most conifers and to control the root suckering of certain deciduous brush.
(f) Krenite should be applied 2 months prior to leaf fall.

9. HOW IT WORKS: When Krenite is applied to brush during the 2 month period prior to fall leaf coloration, it is absorbed by leaves, stems and buds of deciduous plants with little or no apparent effect. The following spring leaf bud development is either prevented or severely limited.

10. EXPECTED RESULTS: Response may not be observed until the following spring, particularly if minimum recommended rates are used or if cool temperatures prevail when spraying is done. However, the following spring, susceptible treated plants will fail to develop leaves and subsequently will die.

11. EFFECTS OF RAINFALL: Rainfall occurring within 24 hours of application may reduce effectiveness.

12. MOVEMENT IN SOIL: Krenite is tightly adsorbed to soil colloids and there is virtually no downward movement in the soil.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Crops and ornamentals may be injured if contacted by drift or spray mist.
Grazing Restrictions: Do not graze on land treated with Krenite.
Crop Use After Hail: Not applicable
Succeeding Crops: Krenite is an industrial brush killer and should only be used on industrial or non-crop land, for brush control.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 24,000 mg/kg (Product)
  oral LD_{50} rabbits = 4,000 mg/kg (Product)
- no short-term or long-term human health problems have been associated with this product
- non-toxic to birds and fish

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

15. PRECAUTIONS AND FIRST AID: Avoid skin and eye contact, and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, flush with water for 15 minutes. Get medical attention.
- If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Store in a cool dry place.

17. WHERE AVAILABLE: Able Industries, Ace Vegetation Control, Molsberry-Division of Reichhold Chemical, Oliver Agricultural Supply, Niagara Chemical Dealers.

Additional information available from:

DuPont Canada Inc.
#105, 333 – 25 Street E.
Saskatoon, Saskatchewan
S7K OL4
Phone: (306) 244-4511

KROVAR I (bromacil + diuron)

1. FORMULATIONS: 80% wettable powder, consisting of 40% diuron (Karmex) + 40% bromacil (Hyvar X).
   Available in 25 kg drums or 2 kg bags.

2. REGISTERED MIXES: None

3. CROPS: Non-crop land only. This is an industrial herbicide used for long term total vegetation control.

4. WEEDS CONTROLLED: Most annual and perennial weeds and in particular grassy weeds.

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Apply Krovar I before or during the period of active growth of weeds for best results. Sufficient moisture from rainfall or artificial means is necessary following treatment to carry the chemical to the root zone of the weeds.

7. HOW TO APPLY:

With: A fixed boom sprayer, calibrated to apply a constant output at constant speed. Small tank type hand sprayer, back pack type sprayer or sprinkling can, may be used to treat smaller areas.

Rate:
- (i) General Weed Control:
  Apply 5.46-7.28 kg/ac **(13.5-18.0 kg/ha)** to control annual and perennial grasses and most broad-leaved weeds. Use higher rates on soils containing 5% or more organic matter or soils high in clay content. Use the 5.46 kg/ac **(13.5 kg/ha)** rate on sandy or sandy loam soils only.
- (ii) Retreatment:
  Apply 2.73-3.64 kg/ac **(6.75-9.0 kg/ha)** when annual weeds reappear on previously treated sites.
- (iii) Small Areas:
  Apply 0.180 kg Krovar I on 100 sq. m.

Water Volume: Use a minimum of 20 L of water/kg of Krovar I.
Incorporation: Not applicable
Pressure: Not restricted
Ground Speed: Not restricted
Nozzles: Not restricted
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a respirator and goggles when opening bags or drums of Krovar I.

8. SPRAYING TIPS:

(a) Before beginning to spray, calibrate the equipment to determine the quantity of water necessary to uniformly cover the measured area to be treated.
(b) Material must be kept in suspension by continuous agitation.
(c) Screen openings should be no smaller than 50 mesh.
(d) Use mechanical or hydraulic means of agitating the mixture in the spray tank to minimize foaming.
(e) If a by-pass or return line is used, it should terminate at the bottom of the tank to minimize foaming.
(f) Do not use air agitation.
(g) Do not apply when the ground is frozen.
(h) Do not apply in any area where bare ground is undesirable.
(i) Do not drain or flush equipment near desirable vegetation or trees or where it may come into contact with the roots of desirable trees or vegetation. A minimum safe interval is one and one half times the height of the tree away from the trunk.
(j) Clean traces of Krovar I from the equipment before using it for any other purpose. Remove nozzle tips and screens and rinse thoroughly and flush the tank, pump, hoses and boom with several changes of water.

9. HOW IT WORKS: Diuron is readily absorbed through the root system and less readily through the foliage and stems. It is translocated upward through the xylem and acts as a photosynthetic inhibitor. Bromacil acts in a similar manner.

10. EXPECTED RESULTS: Susceptible plants become chlorotic soon after treatment and then die. Speed of action will be influenced by the rainfall.

Conditions under which poor results may be expected:
1. Inadequate application rate.
2. Weed growth too mature.
3. Insufficient rainfall.
4. Application on areas subject to severe soil erosion.
5. Application too near the feeding roots of susceptible vegetation.

11. EFFECTS OF RAINFALL: Rainfall will activate the chemical, carrying it rapidly into the root zone where it will kill susceptible weeds and brush.

12. MOVEMENT IN SOIL: Movement in the soil is dependent upon soil type and soil moisture. Bromacil will move more rapidly in a vertical direction in sandy soils than in soils high in organic matter or clay content. May also be moved in soil surface water.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: All crops and ornamentals may be injured by chemical drift. The extent of the injury is dependent upon the volume of chemical falling upon the desirable plants.
Grazing Restrictions: Not applicable
Crop Use After Hail: Not applicable
Succeeding Crops: Krovar I is a non-selective residual herbicide. It should only be used on non-crop land where bare ground is desired.

14. TOXICITY:

- has very low acute mammalian toxicity
  bromacil: oral LD_{50} rats = 5,200 mg/kg
  diuron: oral LD_{50} rats = 3,400 mg/kg
- **long-term exposure to diuron has potential to cause enlarged spleen**
- toxic to fish; non-toxic to birds

15. PRECAUTIONS AND FIRST AID: Avoid exposure of any kind to this product since one active ingredient (diuron) may cause enlarged spleen.

- If on skin, wash off immediately.
- If in eyes, flush for 15 minutes and get medical attention.

16. STORAGE: Store in a cool, dry place.

17. WHERE AVAILABLE: Able Industries, Ace Vegetation Control, Molsberry-Division of Reichhold Chemical, Midland Vegetation Control Inc.

Additional information available from:

DuPont Canada Inc.
#105, 333 – 25 Street E.
Saskatoon, Saskatchewan
S7K OL4
Phone: (306) 244-4511

LADDOK (bentazon + Atrazine)

1. FORMULATIONS: Laddok FL – 200 g/L of bentazon + 200 g/L of atrazine
   Available in 10 litre containers.

2. REGISTERED MIXES: None.

3. CROPS: Corn (field, ensilage, and sweet)

4. WEEDS CONTROLLED: Black nightshade, redroot pigweed, lamb's-quarters, purslane, common ragweed, Russian thistle, corn spurry, lady's-thumb (smartweed), wild mustard, common chickweed, common groundsel, cocklebur. Triazine-resistant strains of the above weeds are also controlled.

5. WEEDS SUPPRESSED: None.

6. WHEN USED:

   Consult label for correct timing on weeds of major concern. In general most weeds will be in the most susceptible stage 18 to 28 days after planting. Corn is tolerant at all growth stages.

7. HOW TO APPLY:

With:	Ground equipment or aerial equipment
Rate:	1.21-1.62 L/ac **(3-4 L/ha)**. Assist oil concentrate at 10 L/1,000 L of spray volume is recommended for optimum performance.
Water Volume:	80-160 L/ac **(200-400 L/ha)**
Incorporation:	Not applicable.
Pressure:	275-400 kPa
Ground Speed:	5.9 km/h
Nozzles:	Do not use flood jet nozzles. Flat fan or hollow cone nozzles may be used.
Protective Equipment:	Standard protective clothing used when applying herbicides.

8. SPRAYING TIPS: Control is best when weeds are young and actively growing.

9. HOW IT WORKS: Both bentazon and atrazine are basically contact herbicides. They both interfere with photosynthetic metabolism but at different sites. In resistant plants they are metabolized to non-toxic products.

10. EXPECTED RESULTS:

    Weeds: Weeds turn yellow initially and then brown, usually within two weeks.
    Crop: Occasionally, very light leaf speckling will occur.

    Conditions under which poor results may be expected:
    1. Weeds beyond recommended growth stage.
    2. Failure to penetrate crop or weed.
    3. Prolonged cool weather and/or drought stress.

11. EFFECTS OF RAINFALL: Rainfall within 6-8 hours of application may reduce activity.

12. MOVEMENT IN SOIL: Very little except on very sandy soils with excessive moisture.

13. GRAZING AND CROPPING RESTRICTIONS:

    Grazing Restrictions: Treated plants may be used for silage.
    Succeeding Crops: On very light soils with low organic matter some atrazine may carry over and injure susceptible crops such as sugar beets and vegetables.

14. TOXICITY:

    Rat – acute oral LD_{50} = 3,030 mg/kg
    Rabbit – dermal LD_{50} is greater than 5,000 mg/kg

15. PRECAUTIONS AND FIRST AID:

    – If on skin, wash with soap and water.
    – If in eyes, flush with water for 15 minutes. Get medical attention.

16. STORAGE: Store in a cool dry place above 0°C.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE: BASF Canada Inc.

Additional information available from:

BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario
M9W 1K1

Phone: (416) 675-3611

BASF Canada Inc.
1705 Norcen Tower
715 – 5 Avenue S.W.
Calgary, Alberta
T2P 2X6
Phone: (403) 237-6661

LASSO (alachlor)

1. FORMULATIONS: Emulsifiable concentrate: 480 g/L (20 L pail)
   Granular 15% (22.7 kg bags)

2. REGISTERED MIXES: Lasso + Atrazine pre-plant incorporated.

   Mixing restrictions: Thorough and uniform mixing is required.
   Mixing with other pesticides: Not recommended

3. CROPS: Corn

   Underseeding: Not recommended

4. WEEDS CONTROLLED: Green foxtail, lamb's-quarters, redroot pigweed.

5. WEEDS SUPPRESSED: If broad-leaf weeds present, tank mix is recommended.

6. WHEN USED:

   - Spring – Pre-plant incorporated on corn in southern Alberta soils with less than 3% organic matter.
   - Early post or surface applications are generally not recommended in southern Alberta

7. HOW TO APPLY:

With: Ground sprayer
Rate:

Soil	Liquid L/ac	Liquid **(L/ha)**	Granules kg/ac	Granules **(kg/ha)**
Sandy	2.43	**(6.0)**	9.1	**(22.5)**
Loam & Clay	2.83	**(7.0)**	10.1	**(25.0)**

Water Volume: 60 L/ac **(150 L/ha)** or more
Incorporation: Time – as soon as possible before seeding
Implements – A double disc working at 7-10 cm followed by a harrow or shallow incorporation with a spring-tine harrow followed immediately by 3-6 cm of irrigation water or rain.
Pressure: 150-275 kPa
Nozzles: All flat or floodjet nozzles delivering 60 L/ac **(150 L/ha)** or more water.
Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening pails of concentrated liquid.
- plus a respirator and goggles when opening bags of granules.

8. SPRAYING TIPS:

   (a) Incorporation equipment (disc recommended) should be set to cut at 7 cm so that the herbicide is distributed in the top 5 cm of soil.
   (b) The herbicide must be uniformly incorporated by operating disc at 8 to 10 km/h and avoid working soils that are excessively moist.
   (c) Use 50 mesh screens particularly when spraying the Lasso + Atrazine tank-mix.

9. HOW IT WORKS: Applied prior to germination, Lasso is absorbed by green foxtail shoots usually resulting in death before emerging through the soil surface. Excessively high rainfall or irrigation (12 cm or more) will result in early loss of control.

10. EXPECTED RESULTS:

    Weeds: Lasso will control green foxtail as it germinates and before it emerges, generally for up to 8-10 weeks after application.

    Crop: No injury has been observed in Alberta when used within recommended label rates.

    Conditions under which poor results may be expected:
    1. Poor incorporation due to wet, cloddy soil or poor mixing action and speed, and resultant stripping.
    2. Delaying incorporation until weed emergence occurs.
    3. Very dry soil conditions.

11. EFFECTS OF RAINFALL: Moisture is required for optimum control but excessive rainfall or irrigation (above 10 cm) will reduce length of control.

12. MOVEMENT IN SOIL: Lasso is mobile in soil under excessive rainfall or irrigation.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: No effect on standing crops
Grazing Restrictions: None (Lasso is metabolized in plants almost completely within 10 days.)
Crop Use After Hail: No restrictions
Succeeding Crops: No carry-over and no cropping restrictions

14. TOXICITY:
   - has very low acute mammalian toxicity
      oral LD_{50} rats = 1,800 mg/kg
      dermal LD_{50} rabbits = 2,000 mg/kg
   - **may cause skin sensitization**; irritating to skin and eyes
   - very toxic to fish; non-toxic to birds

15. PRECAUTIONS AND FIRST AID: Avoid contact of any kind with this product.

   - If on skin, wash off **immediately.**
   - If in eyes, flush with water for 15 minutes. Get medical attention.
   - If swallowed, **do not induce vomiting**. Get medical attention.
   - Take labelled container to doctor.
   - Take the information on this herbicide in this booklet with you to doctor.

   FOR PHYSICIAN: In case of a medical emergency involving a Monsanto herbicide, call this number collect at any time (314) 694-1000.

16. STORAGE: Store above 0°C to keep from freezing. Freezing will result in crystals which will settle to the bottom of the can. Place in a warm room (22°C) and roll or shake the can frequently over a period of several days.

17. WHERE AVAILABLE:

Additional information available from:

Monsanto Canada Inc.
55 Murray Park Road
Winnipeg, Manitoba
R3J 3W2
Phone: (204) 885-6740

LEXONE (metribuzin)

1. FORMULATIONS: Lexone L (480 g/L),
   Available in 10 L containers.
   Lexone DF (75% dry flowable),
   Available in 2.5 kg containers.

2. REGISTERED MIXES: Lexone (both forms) + MCPA amine or Banvel
   Lexone DF + Eptam
   Lexone DF + Treflan

3. CROPS: Wheat (hard red spring and durum), barley (except Klondike), potatoes (except red skinned, early Shepody, ND 146-4R Rideau, Belleisle or Tobique), tomatoes, lentils, fababeans.

4. WEEDS CONTROLLED: Chickweed, stinkweed, corn spurry, volunteer rapeseed, hemp-nettle, ball mustard, wild mustard, lamb's-quarters, lady's-thumb, smartweeds (annual), red root pigweed, shepherd's-purse.

5. WEEDS SUPPRESSED: None

6. WHEN USED:

Spring wheat – 2-5 leaf stage
Barley – 2-5 leaf stage
Tomatoes
- On tomato transplants grown for processing only. Apply as directed spray before weeds are 4 cm high. Check label instructions carefully.

Potatoes
- Do not use on sandy or coarse textured soils containing less than 1% organic matter as crop injury may result. Potato varieties vary in their resistance to Lexone. Use on limited area to determine safety before large scale sprays are adopted.
- Irrigated Potatoes (except Belleisle and Tobique)
- **Pre-emergence** – single application after planting (at least 5 cm deep) or hilling before crop emerges.
- **Early post-emergence** – apply following 3 or more days of sunny weather. Treat before weeds are 3 cm tall and potatoes are less than 10 cm tall. Treatment may cause some leaf burn. Do not use on red skinned, early or Shepody potatoes.
- **Pre-emergence + post-emergence** – follow above directions but do not apply more than 0.57 kg/ac **(1.4 kg/ha)** per season.

Non-Irrigated Potatoes
- **Early post-emergence** – apply soon after emergence and before weeds are 4 cm high (do not use on red skinned, early or Shepody varieties).
- **Preplant incorporated** – apply as by Eptam label. Do not use on soil with greater than 7% organic matter or on sandy or coarse textured soils with less than 2% organic matter as crop injury may result. Do not use on red skinned, early potatoes, Belleisle or Tobique.

Lentils – vines should be less than 10 cm high and plants more than 5 cm below the soil.
Fababeans – apply as a preplant incorporated treatment in the fall or spring with Treflan.

7. HOW TO APPLY:

With: Ground equipment
Rate: Spring wheat – Lexone L – 0.172 L/ac **(0.425 L/ha)**
Lexone DF – 109.2 g/ac **(270 g/ha)**
Can be tank mixed with Banvel at 0.111 L/ac **(0.275 L/ha)** or MCPA amine at 0.344-0.445 L/ac **(0.850-1.1 L/ha)** for broader weed spectrum.

Barley – Lexone L – 0.172-0.223 L/ac
(0.425-0.55 L/ha)
Lexone DF – 109.2-141.6 g/ac
(270-350 g/ha)
Can be tank mixed with MCPA amine at 0.344-0.445 L/ac **(0.85-1.1 L/ha)**. The low rate can be mixed with Banvel at 0.111 L/ac **(0.275 L/ha)**.

Potatoes – Irrigated
Pre-emergence: 0.259-0.567 kg/ac **(0.64-1.4 kg/ha)** in 60-120 L water /ac **(150-300 L water/ha)**
Early post-emergence: 283-388.5 g/ac **(700-960 g/ha)**
Pre-emergence + post-emergence: apply no more than 0.567 kg/ac **(1.4 kg/ha)**.

Potatoes – Dryland
Early post-emergence: 141.6 g/ac **(350 g/ha)**
Preplant incorporated: 141.6-202.3 g/ac **(350-500 g/ha)** Lexone DF plus 1.72-1.78 L/ac **(4.25-4.4 L/ha)** Eptam in 80-120 L water/ac **(200-300 L water/ha)**.

Lentils – 113.3 g/ac **minimum 40 L water/ac (280 g/ha minimum 100 L water/ha)**

Fababeans
Spring preplant incorporate – 0.142-0.205 kg/ac **(0.350-0.500 kg/ha)** plus 0.81 L/ac **(2.0 L/ha)** Treflan.
Fall preplant incorporate – 0.162-0.223 kg/ac **(0.400-0.550 kg/ha)** plus 0.81-1.05 L/ac **(2.0-2.6 L/ha)** Treflan.

Tomatoes – 0.2-0.71 L/ac **(0.5-1.75 L/ha)** depending on soil texture and weed infestation. Check label.

Liquid – One 10 L container treats 44.48 ac **(18 ha)** at 0.223 L/ac **(0.55 L/ha)** rate.
Dry Flowable (DF) – One 2.5 kg container treats 22.24 ac (9 ha) at 109.2 g/ac **(270 g/ha)** rate.

Nozzles: All standard nozzles delivering approximately 40 L/ac **(100 L/ha)**. Do not use flood-jet nozzles. Stainless steel nozzles are recommended.

Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening containers of concentrated liquid.
- plus a respirator and goggles when opening containers of Lexone DF

8. SPRAYING TIPS:

(a) 80° nozzles more efficient than 65° nozzles.
(b) Use 50 mesh line strainer and screens.
(c) Ensure pump is of sufficient capacity to supply agitation.
(d) Do not spray if rain is expected within 2 hours.
(e) Allow 4-5 day interval between applications of Lexone (both formulations) and wild oat herbicides. Lexone can be applied before or after wild oat herbicides.
(f) If frost occurs, allow 4-5 day interval for crop to recover before applying Lexone.
(g) Crop must be planted at least 5 cm deep.
(h) Do not apply to tomatoes within 60 days of harvest.

9. HOW IT WORKS: Lexone is a systemic herbicide which is absorbed by both the foliage and the root system of the plant. Lexone strongly inhibits photosynthesis. Affected plants are chlorotic and stunted. Death usually occurs 10-14 days after treatment. Because Lexone leaves a residue in the soil, control of shallow germinating weeds (eg. chickweed) occurs throughout the growing season.

10. EXPECTED RESULTS:

Weeds: Should start to yellow within 7-10 days after treatment. Speed will depend on growing conditions, weed control will vary depending on specific time of application and growing conditions.

Crop: Temporary (7-10 days) lightening in crop color and occasionally a slight reduction in crop height may occur, especially if frost or abnormally high temperatures occur within 1-2 days of application.

Conditions under which poor results may be expected:
1. Rainfall immediately after application.
2. Weeds in poor growing state (eg. drought).
3. Weeds at a too advanced stage.
4. Poor coverage.

11. EFFECTS OF RAINFALL: Heavy rainfall immediately after application may decrease activity.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Sensitive crops such as rapeseed, mustard, sugar beets can be seriously hurt by drift.
Grazing Restrictions: Do not apply within 60 days of harvest. Do not graze or feed to livestock within 30 days of application.
Succeeding Crops: No restrictions.
NOTE: Potatoes – do not apply within 60 days of harvest.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 1,100 mg/kg
- no short-term or long-term human health problems have been associated with Lexone
- slightly toxic to fish and birds; non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist. Use of goggles recommended while spraying.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes. Get medical attention.

- If Lexone L is swallowed, induce vomiting. Give milk and water freely. Get medical attention.
- Take labelled container to doctor.

16. STORAGE:
Lexone DF – Store in a cool dry place.
Lexone L – It is preferable to store Lexone L in warm storage. Activity is not affected if frozen. However, ensure material has been thoroughly mixed before using.

17. WHERE AVAILABLE: Federated Co-operatives, Niagara Chemical Dealers, Oliver Agricultural Supply, Cargill Grain, United Farmers of Alberta, Alberta Wheat Pool.

Additional information available from:

DuPont Canada Inc.
#150, 333 – 25 Street E.
Saskatoon, Saskatchewan
S7K OL4
Phone: (306) 244-4511

LOROX L (linuron)

1. FORMULATIONS: Lorox L – 480 g/L
   Available in 10 L containers

2. REGISTERED MIXES: Lorox L + MCPA amine.
   Lorox L + Atrazine 80W (field corn).
   Lorox L + Estamine
   Lorox L + Sweep + MCPA
   Lorox L + Target

   Mixing with other pesticides: Not recommended

3. CROPS: Use Lorox L alone on asparagus, carrots, field corn, potatoes, shelterbelts and fruit trees (peach, apple, pear, plum, cherry).

   Use Lorox L + MCPA amine 500 tank mix on hard red spring wheat, durum wheat, oats, barley and flax.

   Underseeding: Do not use on crops underseeded to forage crops. Use Lorox L + MCPA amine + Sweep for fallow weed control.

4. WEEDS CONTROLLED: Lorox L controls: annual grasses such as foxtail (green and yellow), barnyard grass, fall panicum and broad-leaved weeds such as buckwheat (wild), chickweed, corn spurry, cow cockle, goosefoot, groundsel, knotweed, kochia, lamb's-quarters, mustard (wormseed), pigweed (prostrate and redroot), purslane, ragweed, shepherd's-purse, smartweeds (annual), sow-thistle (annual), stinkweed, wild radish.

   Lorox L + MCPA amine 500 tank mix controls: broad-leaved weeds such as buckwheat (wild and Tartary), chickweed, cocklebur, common burdock, cow cockle, goat's-beard, green smartweed, hemp-nettle, kochia, lady's thumb, lamb's-quarters, mustard (ball, hare's ear, Indian, tumble, wild and wormseed), pigweed (prostrate and red root), Russian thistle, prickly lettuce, ragweed (common and giant), shepherd's-purse, stinkweed, stork's-bill, wild radish.

5. WEEDS SUPPRESSED: Canada thistle.

6. WHEN USED: 2-4 leaf stage of weeds, 1-3 leaf stage of green foxtail.
   Crop stage:
   Corn – Pre-emergence (Lorox L + atrazine) Post-emergence Lorox L alone after corn is at least 38 cm high DIRECTED SPRAY.
   Cereals 2-4 leaf stage
   Carrots (post-emergence) 2 or more fully developed true leaves, 10-15 cm in height.
   Asparagus – immediately after discing, before emergence, may be repeated after last cutting.
   Potatoes (pre-emergence) – before weedy grasses are 8 cm tall and broad-leaf weeds 15 cm tall.
   Shelterbelts – Apply only on stock planted for at least one year as a directed spray under trees and bushes. Apply before weeds are 10 cm high and before buds open in spring.
   Fruit trees – Apply as a directed spray under trees before weeds are 10 cm high. Use only where trees have been established in the orchard for at least 10 years (1 year for peach trees).
   Fallow – Use in spring when weeds are 2-4 leaf. Apply only once per season.

7. HOW TO APPLY:

   With: Ground equipment
   Rate: Cereals and flax – Lorox L at 0.172-0.223 L/ac **(0.425-0.55 L/ha)** plus 0.343-0.445 L/ac **(0.85-1.1 L/ha)** MCPA amine.
   Field Corn
   Pre-emergence
   (a) Low organic soils (2% or less)
   Lorox L – 0.91 L/ac **(2.25 L/ha)** +
   Atrazine 80W – 0.607 kg/ac **(1.5 kg/ha)**
   (b) Medium organic soils (2 to 5%)
   Lorox L – 1.315 L/ac **(3.25 L/ha)** +
   Atrazine 80W – 0.91 kg/ac **(2.25 kg/ha)**
   Post-emergence – Lorox 0.971-1.821 L/ac **(2.4-4.5 L/ha)** plus an oil water emulsion. Apply as a DIRECTED SPRAY. Read label carefully for detailed instructions.
   Carrots – Pre-emergence (crop) – 0.445-1.376 L/ac **(1.1-3.4 L/ha)** in 80-120 L water/ac **(200-300 L water/ha)**. Post-emergence (crop) – 0.91-1.82 L/ac **(2.25-4.5 L/ha)** in 80-120 L water/ac **(200-300 L water/ha)**.
   Combination pre-emergence and post-emergence (crop) – 0.445-1.91 L/ac **(1.1-2.25 L/ha)** followed by 0.91-1.82 L/ac **(2.25-4.5 L/ha)**, provided treatments are at least two weeks apart.
   Asparagus – Pre-emergence (crop) –
   1.376-1.82 L/ac **(3.4-4.5 L/ha)** in 120 L water/ac **(300 L water/ha)**.
   Potatoes – Pre-emergence (crop) – 0.91-1.82 L/ac **(2.25-4.5 L/ha)** in 120 L water/ac **(300 L water/ha)**.
   Shelterbelts – single application of 1.82 L/ac **(4.5 L/ha)**.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Fruit trees – single application of 3.64 L/ac **(9.0 L/ha)** Lorox L plus surfactant in 160-240 L/ac **(400-600 L/ha)** water.
At 0.223 L/ac **rate, one 10 L container will treat 44.48 ac. (At 0.55 L/ha rate, one 10 L container will treat 18 ha).**
Fallow – Lorox L at 0.210 L/ac **(.52 L/ha)** plus MCPA and Sweep at recommended rates.

Water Volume: 40 L/ac **(100 L/ha)**
Incorporation: Not applicable
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: All standard nozzles delivering approximately 40 L/ac **(100 L/ha)**. Do not use flood-jet nozzles. Stainless steel nozzles are recommended.
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

(a) 80° nozzles more efficient than 65° nozzles.
(b) Use 50 mesh line strainers and screens.
(c) Ensure pump is of sufficient capacity to supply agitation.
(d) Do not spray if rain is expected within 2 hours.
(e) Fruit trees – avoid contact with fruit, foliage, and green bark with spray or drift as injury may result.

9. HOW IT WORKS: Lorox L is a systemic herbicide which is absorbed through both the foliage and the root system of the plant. Once in the plant, its mode of action is to strongly inhibit photosynthesis. Outward appearance of affected plants is chlorosis (yellowing), stunting and finally death which occurs 10-14 days after treatment.

10. EXPECTED RESULTS:

Weeds: Yellowing will start within 7-10 days after application. Speed will depend on temperature and moisture conditions. Effect is greatest when growing conditions are excellent. Weed control will vary depending on species, time of application and growing conditions.

Crop: A slight yellowing of the crop mainly due to leaf tip and leaf margin burn may be seen 7-10 days after application. This usually is not visible after 14-18 days.

Conditions under which poor results may be expected:
1. Rainfall within 2 hours of application.
2. Weeds in a poor growing state (eg. drought).
3. Weeds too mature.
4. Poor coverage.

11. EFFECTS OF RAINFALL: Heavy rainfall within 2 hours may decrease activity.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Sensitive crops such as rapeseed, mustard, sugar beets, shelterbelts, and gardens can be seriously hurt by drift.
Grazing Restrictions: Do not feed green plants to livestock.
Succeeding Crops: No restrictions, except when mix with atrazine is used. See Aatrex.

14. TOXICITY:

- has very low acute toxicity to mammals
  oral LD_{50} rats = 1,500 mg/kg
- no short-term or long-term human health problems observed for Lorox when used according to label
- very toxic to fish; non-toxic to bees

15. PRECAUTIONS AND FIRST AID: May irritate eyes, nose, throat and skin. Avoid breathing spray mist.

- If on skin, wash off immediately.
- If in eyes, wash for 15 minutes. Get medical attention.
- If swallowed, induce vomiting. Give plenty of water or milk. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Lorox L – Store in a heated area. Do not freeze as settling may occur. If frozen, thoroughly mix to ensure uniformity. Activity is not affected if frozen.

17. WHERE AVAILABLE: Alberta Wheat Pool, United Grain Growers, United Farmers of Alberta, Federated Co-operatives, Oliver Agricultural Supply, Green Cross Product Dealers, Niagara Chemical Dealers, Cargill Grain, Pioneer Grain.

Additional information available from:

DuPont Canada Inc.
#105, 333 – 25 Street E.
Saskatoon, Saskatchewan
S7K OL4
Phone: (306) 244-4511

MATAVEN (flamprop-methyl)

1. FORMULATIONS: Liquid emulsifiable concentrate, 84 g/L
   Available in 20 L steel cans

2. REGISTERED MIXES: None

   Mix instructions: Add the required amount of Mataven to half the required water volume in the spray tank, start agitation, then add the balance of the water. The resulting emulsion is relatively stable, requiring only gentle agitation. If the emulsion is allowed to stand unused for several hours, the spray may require agitation to re-emulsify.

   Mixing with other pesticides: Not recommended

3. CROPS: All recommended spring, winter and durum wheats, canary grass, triticale, forage crops grown for seed (includes alfalfa, bromegrass, meadow fescue, creeping red fescue, Russian wild ryegrass, intermediate wheatgrass, and crested wheatgrass in the year of seeding).

   Underseeding: With the forage crops listed above.

4. WEEDS CONTROLLED: Wild oats

5. WEEDS SUPPRESSED: None

6. WHEN USED: 3 leaf to shot blade stage of the wild oats; wild oats at the 2 leaf stage and younger may escape control and may grow to maturity. The wheat crop at the time of application should not be beyond the 6 leaf stage.

7. HOW TO APPLY:

With:	Aircraft or ground equipment
Rate:	2.02 L/ac **(5.0 L/ha)** or [2.02-3.03 L/ac **(5.0-7.5 L/ha)** with grass forage crops using the high rate when forage crops are grown without a companion crop and the low rate when grown with wheat as a companion crop]. [One 20 L can treats 9.88 ac (4.0 ha)]
Incorporation:	Not applicable
Water Volume:	Aircraft – minimum – 8 L ac (20 L/ha) Ground – 40 L/ac **(100 L/ha)**
Nozzles:	Standard nozzles delivering 40 L/ac **(100 L/ha)** at 9 km/h
Pressure:	300 kPa
Protective Equipment:	Standard protective equipment used when applying herbicides. – plus a face shield and apron when opening cans of concentrated liquid.

8. SPRAYING TIPS:

Timing:	Best results with Mataven will probably be obtained when the majority of wild oats are at the 3-4 leaf stage, but before the shot blade stage. Excellent weed control and optimum yield increases will result from this timing.
Broad-leaf Herbicides:	Wild oat control can be substantially reduced if Mataven is tank-mixed with broad-leaf herbicides. For best wild oat control, allow an interval of 4 days between the application of Mataven and the use of MCPA, Torch, Blagal, Buctril M or Brominal M and an interval of 7 days with the use of 2,4-D or Banvel formulations.
Water Volume:	The 40 L/ac **(100 L/ha)** spray volume will provide better coverage, resulting in better control of wild oats, especially where there is a heavy crop canopy or dense growth of wild oats.
Boom Angle:	Direct spray pattern 45° forward to enhance spray penetration. Ensure boom height is such that the spray from adjacent nozzles meets just above the wild oats.
Rainfall:	Do not apply if rainfall is expected within 2 hours.
Aircraft:	Do not spray when winds are greater than 15 km/h, avoid overlapping.

9. HOW IT WORKS: Mataven is a systemic herbicide which achieves a high degree of control when applied to wild oats between the 3 leaf to shot blade stages. Mataven enters the wild oat through the leaves and is converted to a biologically active acid. This acid is readily transported from the leaves to the growing point in the stem. Here, cell elongation is inhibited and cell initiation and division is impaired. The wild oat is killed, or stunted to such a degree that it is unable to compete with the crop.

10. EXPECTED RESULTS:

    Wild oat performance: Mataven, used as recommended, consistently gives wild oat control of 90% and greater. The other 10% or less of so-called "escapes" are not strong, vigorous wild oat plants producing 100 or more seeds per plant, but are small, stunted wild oats with few shrivelled seeds.

    Wild oat symptoms: The wild oats will turn a dark blue-green color approximately 10 days after spraying. Later the wild oats turn yellow and brown. Wild oats in the 1-2 leaf stage at application may often appear controlled but may escape and grow to maturity.

    Crop: Selkirk and Garnet wheat may show damage from the application of Mataven.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Conditions under which poor results may be expected:

1. Rainfall within 2 hours of application.
2. Too low a rate of Mataven.
3. Poor wild oat coverage due to low water volume, low pressure, wind, heavy crop canopy or a combination of these factors.
4. Application too early – many wild oats with less than 3 leaves at application.
5. Tank-mix application before 4-5 leaf stage or with a non-recommended product.

11. EFFECTS OF RAINFALL: Rainfall within 2 hours of application will reduce effectiveness.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Drift potential is low from ground and air application as long as standard practices and common sense are used. Oats would be the most seriously affected crop.
Grazing Restrictions: Do not graze treated areas.
Crop Use After Hail: Do not graze or feed to livestock.
Succeeding Crops: No restrictions.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 5,000 mg/kg
  dermal LD_{50} rabbits = 2,000 mg/kg
- no short-term or long-term human health problems have been associated with Mataven
- non-toxic to bees
- not a skin sensitizer

15. PRECAUTIONS AND FIRST AID: May cause skin and eye irritation shortly following use. Use of goggles recommended.

- If on skin, wash off immediately.
- If in eyes, wash for 15 minutes, and get medical attention.
- If swallowed, **do not induce vomiting because of petroleum distillates**. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Mataven may crystallize if stored at temperatures below 0°C and therefore, heated storage is recommended. If the product is frozen there is no loss of activity as long as the frozen product is warmed and vigorously shaken or agitated before being added to the water in the spray tank.

17. WHERE AVAILABLE: Green Cross Dealers, Shell Farm Supply Dealers, Co-op Farm Supply Centres, United Grain Growers, Pioneer Grain and many independent agrochemical dealers.

Additional information available from:

Ciba Geigy/Green Cross Products
820 – 26 Street NE
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

MCPA (amine)

1. FORMULATIONS:

	g active/L
MCPA amine	500
MCPA ester	500
MCPA Potassium salt	400
MCPA Sodium salt	300

Available in 20 L containers.

2. REGISTERED MIXES:

(a) MCPA amine + Afolan F
+ Banvel
+ Lexone
+ Lorox L
+ Pardner
+ Sencor
+ Sweep
+ TCA
+ Torch
(b) MCPA ester + Avenge
+ Pardner
+ Sweep
+ Torch

For registered mixes of MCPA ester with Avenge 200C – use up to 0.453 L/ac **(1.12 L/ha)** of MCPA ester with 1.416 or 1.7 L/ac **(3.5 or 4.2 L/ha)** of Avenge 200C. For registered mixes of MCPA ester + Torch with Avenge 200C – use 0.227 L/ac **(0.56 L/ha)** of MCPA ester + 0.486-0.607 L/ac **(1.2-1.5 L/ha)** of Torch with 1.416 or 1.7 L/ac **(3.5 or 4.2 L/ha)** of Avenge 200C.

(c) MCPA Potassium Salt + Banvel

(d) MCPA Sodium Salt + TCA

Mixing restrictions: Insure that the proper formulation of MCPA is used with the product considered for mixing.

Mixing with other pesticides: Not recommended

3. CROPS:

MCPA amine	MCPA ester	MCPA Potassium	MCPA Sodium
Hard red spring, durum winter wheat, barley, oats, fall rye, flax, asparagus, peas (field and processing), pastures and non-cropland. Note: See label for restrictions on crops and weeds controlled	Hard red spring, winter wheat, barley, oats, rye, flax, pastures and non-cropland	Wheat, barley, oats, flax	Wheat, barley, oats, flax, rye, asparagus, peas, pasture, non-crop land

Underseeding: Not recommended

4. WEEDS CONTROLLED:

MCPA amine	MCPA ester	MCPA Potassium Salt	MCPA Sodium Salt
American dragonhead, biennial wormwood, bluebur, cocklebur, common burdock, flixweed, goat's-beard, goosefoot, hairy galinsoga, lamb's-quarters, mustard (ball, dog, hare's-ear, tumble, wild, wormseed), peppergrass (common), pigweed (Russian and redroot), purslane, ragweed (common), stinkweed, thyme-leaved spurge	Lamb's-quarters, mustard (ball, hare's-ear, tumble, wild, wormseed), ragweed (common), stinkweed	Lamb's-quarters, mustard (ball, hare's-ear, tumble, wild, wormseed) ragweed (common), stinkweed	

5. WEEDS SUPPRESSED:

MCPA amine	MCPA ester	MCPA Potassium	MCPA Sodium
Annual smartweed, buckwheat (Tartary, wild), Canada thistle, hemp-nettle, knapweed (Russian), leafy spurge, plantain (common), pigweed (Russian and redroot), shepherd's-purse, sow-thistle (annual, perennial), wild radish			Bluebur plus weeds shown under MCPA amine and ester.

6. WHEN USED:

Crop	MCPA amine	MCPA ester	MCPA Potassium	MCPA Sodium
Barley, oats, spring wheat	4 leaf to just before flag leaf stage	4 leaf to just before flag leaf stage	2-6 leaf stage (depending on rate)	4 leaf to just before flag leaf stage
Winter cereals (including fall rye)	Before crop tillering in the spring	Before crop tillering in the spring	Not Recommended	Before crop tillering in the spring
Flax	From 5 cm height to just before bud formation		5-10 cm high	From 5 cm height to just before bud formation
Peas	When crop is 10-18 cm tall use at least 70 L/ac (170 L/ha)	Not Recommended	Not Recommended	When crop is 10-18 cm tall use at least
water			60 L/ac **(150 L/ha)** water	
Asparagus	Following cultivation just before first spears appear. May repeat at end of cutting season	Not Recommended	Not Recommended	Following cultivation just before first spears appear. May repeat at end of cutting season
Pastures	Before growth of grasses and legumes begins in the spring		Not Recommended	Before growth of legumes and grasses begins in the spring

7. HOW TO APPLY:

With: Ground equipment or aircraft
Rate:

Crop	MCPA amine	MCPA ester	MCPA Potassium	MCPA Sodium
Wheat, oats, barley, winter cereals, including rye, flax	0.283-0.708 L/ac **(0.7-1.75 L/ha)** One 20 L container treats 70.67 ac **(28.6 ha)** cereals at the 0.283 L/ac **(0.7 L/ha)** rate	0.283-0.708 L/ac **(0.7-1.75 L/ha)**	0.607-0.809 L/ac **(1.5-2.0 L/ha)** Not Recommended on winter cereals	0.486-1.113 L/ac **(1.2-2.75 L/ha)** One 20 L container treats 40 ac **(16.2 ha)** at 0.486 L/ac **(1.2 L/ha)** rate
Asparagus	1.416 L/ac **(3.5 L/ha)**	Not Recommended		2.26 L/ac **(5.5 L/ha)**
Peas	0.283 L/ac **(0.7 L/ha)**	Not Recommended		0.607 L/ac **(1.5 L/ha)**
Pastures and non-cropland	0.445-0.809 L/ac **(1.1-2.0 L/ha)**	0.445-0.809 L/ac (1.1-2.0 L/ha)	Not Recommended	0.708-1.315 L/ac **(1.75-3.25 L/ha)**

Water Volume: Aircraft – minimum 8 L/ac **(20 L/ha)**
Ground equipment – 40 L/ac **(100 L/ha)**
Incorporation: Not applicable
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: All standard and low pressure nozzles delivering 40 L/ac **(100 L/ha)**
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

(a) Drift from spray can be reduced by using high volume sprays under low pressure, coarse sprays and drop nozzles.
(b) Do not spray during windy conditions or when air temperature is above 27°C.
(c) Do not spray if rain is expected within 2 hours.
(d) Avoid spray drift to sensitive crops.
(e) Extremely hard water may reduce performance or cause problems in spraying the product.
(f) Application before or after recommended stage may result in crop injury.

9. HOW IT WORKS: MCPA is a systemic herbicide which is absorbed by all leaf and stem surfaces. It is translocated throughout the plant and concentrates in the actively growing region of the plant. MCPA disrupts cell division, causing abnormal growth response, as well as affecting respiration and food reserves. This is followed by twisting of the weeds and their eventual death.

10. EXPECTED RESULTS:

Weeds: Weeds start to show twisting effects between 2 to 20 days after spraying, depending on weather conditions, formulation and weeds. Following the twisting and bending, plants will turn brown and then die. Only those weeds that are emerged at time of spraying will be controlled.

Crops: Yellowing and thinning of the crop may be noticed if higher than recommended rates are applied. Generally speaking, MCPA is easier on the crop than is 2,4-D.
NOTE: Consult label for cautions concerning use of higher rates on certain crops.

Conditions under which poor results may be expected:
1. Rain within 2 hours of application.
2. Use of extremely hard water in the spray tank.

11. EFFECTS OF RAINFALL: Rain within 2 hours of application will decrease activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift with amine and salts is lower than from esters but avoid drift onto susceptible crops such as rapeseed, mustard, sunflower, potatoes, shelterbelts and gardens.
Grazing Restrictions: Do not graze dairy cattle within 7 days after spraying.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

14. TOXICITY:

- has low acute toxicity to mammals
  oral LD_{50} rats = 700 mg/kg
- no short-term or long-term human health problems are associated with MCPA
- very toxic to fish (LC_{50} 48 hours = 1.5 ppm)

15. PRECAUTIONS AND FIRST AID: Extreme exposure to MCPA may cause muscular weakness, vomiting, perspiration. Avoid contact with skin and eyes and do not inhale spray mist.
    - If on skin, wash off with soap and water.
    - If in eyes, flush with water for 15 minutes. Get medical attention.
    - If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
    - Take labelled container with you to doctor.

16. STORAGE: If the product was stored under freezing conditions, warm to 5°C and mix well before using.

17. WHERE AVAILABLE: Various formulations of MCPA are available from all major suppliers of agricultural chemicals.

Additional information available from:

Uniroyal Chemical
4, 1323 – 44 Avenue, N.E.
Calgary, Alberta
T2E 6L5
Phone: (403) 276-9481

Dow Chemical Canada Inc.
Suite 2412, 10025 Jasper Avenue
Edmonton, Alberta
T5J 1S6
Phone Toll Free: 1-800-661-6436

OR manufacturer of brand purchased.

MCPA (ester)

1. FORMULATIONS: 500 g/L present as mixed butyl esters
Available in 20 L containers

2. REGISTERED MIXES: MCPA + Avenge
MCPA + Pardner
MCPA + Sweep
MCPA + Torch

For registered mixes of MCPA ester with Avenge 200C – use up to 0.453 L/ac **(1.12 L/ha)** of MCPA ester with 1.416 or 1.7 L/ac **(3.5 or 4.2 L/ha)** of Avenge 200C.
For registered mixes of MCPA ester + Torch with Avenge 200C use 0.227 L/ac **(0.56 L/ha)** of MCPA ester + 0.486-0.607 L/ac **(1.2-1.5 L/ha)** of Torch with 1.416 or 1.7 L/ac **(3.5 or 4.2 L/ha)** of Avenge 200C.

Mixing restrictions: Insure that the proper formulation of MCPA is used with the product considered for mixing.
Mixing with other pesticides: Not recommended.

3. CROPS: Spring and winter wheat, barley, oats, rye, flax, pastures and non-cropland.

Underseeding: Not recommended

4. WEEDS CONTROLLED: Common ragweed, lamb's-quarters, mustard (ball, hare's-ear, tumble, wild, wormseed), stinkweed.

5. WEEDS SUPPRESSED: Buckwheat (Tartary and wild), Canada thistle, common plantain, hemp-nettle, knapweed (Russian), leafy spurge, pigweed (redroot and Russian), shepherd's-purse, smartweeds (annual), sow-thistle (annual, perennial), wild radish.

6. WHEN USED:

Spring wheat, barley, oats – 4 leaf to just before flag leaf Winter cereals – before crop tillering in the spring Flax – from 5 cm height to just before bud formation Pastures – treat before growth of legumes and grasses starts in spring

7. WHEN USED:

With:	Ground equipment or aircraft
Rate:	Wheat, barley, oats, rye, flax – 0.283-0.708 L/ac **(0.70-1.75 L/ha)**. Pastures – 0.445-0.809 L/ac **(1.1-2.0 L/ha)** One 20 L pail will treat 70.67 ac (28.6 ha) at the 0.283 L/ac **(0.70 L/ha)** rate.
Water Volume:	Aircraft – minimum of 8 L/ac **(20 L/ha)** Ground Equipment – 16-40 L/ac **(40-100 L/ha)**
Incorporation:	Not applicable.
Pressure:	275 kPa
Ground Speed:	9 km/h
Nozzles:	All standard and low pressure nozzles delivering 16-40 L/ac **(40-100 L/ha)** of water.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

(a) Drift from spray can be reduced by using high volume sprays under low pressure, coarse sprays and drop nozzles.
(b) Do not spray during windy conditions or when air temperature is above 27°C.
(c) Do not spray if rain is expected within 2 hours.
(d) Avoid spray drift to sensitive crops.
(e) Extremely hard water may reduce performance or cause problems in spraying the product.
(f) Application before or after recommended stage may result in crop injury.

9. HOW IT WORKS: MCPA is a systemic herbicide which is absorbed by all leaf and stem surfaces. It is translocated throughout the plant and concentrates in the actively growing region of the plant. MCPA disrupts cell division, causing abnormal growth response, as well as effecting respiration and food reserves. This is followed by twisting of the weeds and their eventual death.

10. EXPECTED RESULTS:

Weeds: Weeds start to show twisting effects between 2 to 20 days after spraying, depending on weather conditions, formulation and weeds. Following the twisting and bending, plant will turn brown and then die. Only those weeds that are emerged at time of spraying will be controlled.

Crops: Yellowing and thinning of the crop may be noticed if higher than recommended rates are applied. Generally speaking, MCPA is easier on the crop than is 2,4-D. NOTE: Consult label for cautions concerning use of higher rates on certain crops.

Conditions under which poor results may be expected:
1. Rain within 2 hours of application.
2. Use of extremely hard water in the spray tank.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

11. EFFECTS OF RAINFALL: Rain within 2 hours of spraying will decrease activity.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is high. Avoid drift onto susceptible crops such as rapeseed, mustard, sunflowers, potatoes, shelterbelts and gardens.
Grazing Restrictions: Do not graze dairy cattle within 7 days after spraying.

14. TOXICITY:

- has low acute mammalian toxicity
  oral LD_{50} rats = 700 mg/kg
- no short-term or long-term human health problems are associated with MCPA
- very toxic to fish (LC_{50} 48 hours = 1.5 ppm)

15. PRECAUTIONS AND FIRST AID: Extreme exposure to MCPA may cause muscular weakness, vomiting, perspiration. Avoid contact with skin and eyes, and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, flush with water for 15 minutes and get medical attention.
- If swallowed, **do not induce vomiting.** Get medical attention immediately.
- Take labelled container to doctor.

16. STORAGE: Do not freeze. If subjected to freezing, warm to at least 5°C and mix thoroughly.

17. WHERE AVAILABLE: Various formulations of MCPA are available from all major suppliers of agricultural chemicals.

Additional information available from:

Dow Chemical Canada Inc.
Suite 2412, 10025 Jasper Avenue
Edmonton, Alberta
T5J 1S6
Phone Toll Free: 1-800-661-6436

Uniroyal Chemical
4, 1323 – 44 Avenue N.E.
Calgary, Alberta
T2E 6L5
Phone: (403) 276-9481

OR the manufacturer of the brand purchased.

MCPA (salts)

1. FORMULATIONS: 400 g/L present as a potassium salt.
   300 g/L present as a sodium salt.
   Both available in 20 L containers.

2. REGISTERED MIXES: MCPA (potassium salt) + Banvel
   MCPA (sodium salt) + TCA

   Mixing restrictions: Ensure that the proper formulation of MCPA is used with the product considered for mixing.
   Mixing with other pesticides: Not recommended.

3. CROPS: Wheat, barley, oats, flax, (rye, asparagus, peas, pastures and non-cropland – MCPA Sodium Salt 300 only).

   Underseeding: Not recommended

4. WEEDS CONTROLLED: Common ragweed, lamb's-quarters, mustard (ball, hare's-ear, tumble, wild, wormseed), stinkweed.

5. WEEDS SUPPRESSED: Bluebur, buckwheat (Tartary and wild), Canada thistle, common plantain, hemp-nettle, knapweed (Russian), leafy spurge, pigweed (redroot and Russian), shepherd's-purse, smartweeds (annual), sow-thistle (annual and perennial), wild radish.

6. WHEN USED: (Crop stage)

	MCPA sodium salt	**MCPA potassium salt**
Spring wheat, barley, oats	4 leaf to just before flag leaf	2-6 leaf stage, depending on rate (see label)
Winter cereals	Before crop tillering in the spring	Not recommended
Flax	From 5 cm height to just before bud formation	5-10 cm high
Asparagus	Following a cultivation just before first spears appear, treatment may be repeated at end of cutting season	Not recommended
Peas	When peas are 10-18 cm tall with not less than 60 L/ac **(150 L/ha)** of water	Not recommended
Pastures	Before growth of legumes and grasses starts in spring	Not recommended

7. HOW TO APPLY:

With: Ground equipment or aircraft
Rate: NOTE: higher rates recommended for hard-to-kill weeds may cause crop damage.

Crop	MCPA Sodium Salt	MCPA Potassium Salt
Spring wheat, oats, barley	i0.486-1.113 L/ac **(1.2-2.75 L/ha)**	0.607-0.809 L/ac **(1.5-2.0 L/ha)**
Winter cereals (includes rye)	0.486-1.113 L/ac **(1.2-2.75 L/ha)**	Not Recommended
Flax	0.486-1.113 L/ac **(1.2-2.75 L/ha)**	0.607-0.809 L/ac **(1.5-2.0 L/ha)**
Asparagus	2.2 L/ac **(5.5 L/ha)**	Not Recommended
Peas	0.61 L/ac **(1.5 L/ha)**	Not Recommended
Pastures	0.71-1.3 L/ac **(1.75-3.25 L/ha)**	Not Recommended

[One 20 L container will treat 40 ac (16.2 ha) at 0.486 L/ac **(1.2 L/ha)** rate]

Water Volume: Aircraft – minimum 8 L/ac **(20 L/ha)**
Ground equipment – 40 L/ac **(100 L/ha)**
Incorporation: Not applicable
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: All standard and low pressure nozzles delivering 40 L/ac **(100 L/ha)**

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening containers of the concentrated liquid.

8. SPRAYING TIPS:

(a) Drift from spray can be reduced by using high volume sprays under low pressure, coarse sprays and drop nozzles.
(b) Do not spray during windy conditions or when air temperature is above 27°C.
(c) Do not spray if rain is expected within 6 hours.
(d) Avoid spray drift to sensitive crops.
(e) Extremely hard water may reduce performance or cause problems in spraying the product.
(f) Application before or after recommended stage may result in crop injury.

9. HOW IT WORKS: MCPA is a systemic herbicide which is absorbed by all leaf and stem surfaces. It is translocated throughout the plant and concentrates in the actively growing region of the plant. MCPA disrupts cell division, causing abnormal growth response, as well as affecting respiration and food reserves. This is followed by twisting of the weeds and their eventual death.

10. EXPECTED RESULTS:

Weeds: Weeds start to show twisting effects between 2 and 10 days after spraying, depending on weather conditions, formulation and weeds. Following the twisting and bending, plants will turn brown and then die. Only those weeds that are emerged at time of spraying will be controlled.

Crops: Yellowing and thinning of the crop may be noticed if higher than recommended rates are applied. Generally speaking, MCPA is easier on the crop than is 2,4-D.

Conditions under which poor results may be expected:
1. Rain within 6 hours of application.
2. Use of extremely hard water in the spray tank.

11. EFFECTS OF RAINFALL: Rain within 6 hours of spraying will decrease activity.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is lower than from esters or amines but avoid drift onto susceptible crops such as rapeseed, mustard, sunflowers, potatoes, shelterbelts and gardens.
Grazing Restrictions: Do not graze dairy cattle within 7 days after spraying.

14. TOXICITY:

- has low acute mammalian toxicity
  oral LD_{50} rats = 700 mg/kg
- no short-term or long-term human health problems are associated with MCPA
- very toxic to fish (LC_{50} 48 hours = 1.5 ppm)

15. PRECAUTIONS AND FIRST AID: Extreme exposure to MCPA may cause muscular weakness, vomiting, perspiration. Avoid contact with skin and eyes, and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container with you to doctor.

16. STORAGE: If the product was stored under freezing conditions warm to 5°C and mix well before using.

17. WHERE AVAILABLE: Various formulations of MCPA are avialable from all major suppliers of agricultural chemicals.

Additional information available from:

Dow Chemical Canada Inc.
Suite 2412, 10025 Jasper Ave.
Edmonton, Alberta
T5J 1S6
Phone: (403) 428-0439

Uniroyal Chemical
4, 1323 – 44 Avenue
Calgary, Alberta
T2E 6L5
Phone Toll Free: 1-800-661-6436

OR the manufacturer of the brand purchased.

MECOTURF (mecoprop)

1. FORMULATIONS: Water soluble 150 g/L active ingredient
   Available in 4 and 20 L containers

2. REGISTERED MIXES: No tank mixes recommended.

3. CROPS: Wheat, barley, oats, lawns and turf.

   Underseeding: Not recommended

4. WEED CONTROLLED: Black medic, buttercup, clover, chickweed, corn spurry, dandelion, plantain, stitchwort.

5. WEEDS SUPPRESSED: Canada thistle

6. WHEN USED: Between the 3 leaf and early flag leaf stage.

7. HOW TO APPLY:

   With: Ground equipment
   Rate: Cereals – 2.226-2.833 L/ac **(5.5-7 L/ha)**
   Lawns, turf – 2.226-3.44 L/ac **(5.5-8.5 L/ha)**
   Water Volume: Cereals – 80-120 L/ac **(200-300 L/ha)**
   Lawns, turf – 80-160 L/ac **(200-400 L/ha)**
   Incorporation: Not applicable
   Pressure: 300 kPa
   Ground Speed: 9 km/h
   Nozzles: No restrictions with the 80-120 L/ac **(200-300 L/ha)** capacity
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a face shield and apron when opening containers of concentrated Mecoturf.

8. SPRAYING TIPS: Recommended water volume is essential for optimum weed control. See label for specific instructions concerning lawns and turf.

9. HOW IT WORKS: Mecoprop is a systemic herbicide within the MCPA group which is slower acting. Like other members of this herbicide group, mecoprop interferes with the breakdown of nucleic acids and disrupts the translocation system in the plants due to abnormal cell growth, causing the accumulation of plant food in the shoots and subsequent starvation of the roots.

10. EXPECTED RESULTS:

    Weeds: Some leaf curling and stem and petiole twisting should be visible within 4-5 days after spraying. Weeds should be completely dead within 3-4 weeks of application.

    Crop: Wheat, barley, and oats have a high tolerance of mecoprop applied at the recommended rates and water volume. Deformed heads, missing florets and twisted awns could result if recommendations are not followed or if stressed environmental conditions occur.

    Conditions under which poor results may be expected:
    1. Water volumes lower than 80 L/ac **(200 L/ha)** will result in reduced control.
    2. Cold weather and drought cause a delay in weed control action.

11. EFFECTS OF RAINFALL: Decreased effectiveness will result if rain occurs within 4-6 hours.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Since it is a salt formulation, danger of vapor drift is low. Droplet drift should be avoided.
    Grazing Restrictions: Do not graze within 14 days of application.
    Crop Use After Hail: No restrictions if 14 days after application.
    Succeeding Crops: No restrictions.

14. TOXICITY:

    - has very low acute mammalian toxicity
      oral LD_{50} rats = 1,060 mg/kg
    - **has potential to cause enlarged kidneys following long-term exposure to this product**
    - however, no long-term or short-term human health problems have been observed when used according to label.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

15. PRECAUTIONS AND FIRST AID: Avoid any kind of prolonged exposure to this product. Avoid contact with skin and eyes and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, wash with clear water for 15 minutes. Get medical attention.
- If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Do not store at temperatures below 0°C. If stored for 1 year or longer, shake well before using.

17. WHERE AVAILABLE: Niagara Chemical Dealers.

Additional information available from:

Niagara Chemical
Division of Reichhold Ltd.
1274 Plains Road East
Box 5004
Burlington, Ontario
L7R 3Z1
Phone: (416) 634-2355

NaTA (sodium trichloroacetic acid)

1. FORMULATIONS: A prill containing 85% TCA acid equivalent present as sodium salts.

2. REGISTERED MIXES:

   NaTA + 2,4-D amine
   NaTA + MCPA amine
   NaTA + MCPA sodium salt
   NaTA + Buctril M

   Note: Consult tank mix herbicide label before using.

3. CROPS: Flax, rapeseed, barley, oats, field peas (not for canning or processing), sugar beets, red beets, non-crop land.

4. WEED CONTROLLED: Green and yellow foxtail.

5. WEEDS SUPPRESSED: Quackgrass.

6. WHEN USED: NaTA should be applied when the foxtail is in the 1 to 3 leaf stage.

   Oats, barley and rapeseed – 2 to 4 leaf stage of crop.
   Sugar beets – 1 to 3 leaf stage.
   Flax – 10 to 15 cm high.
   Field peas – vines 10 to 20 cm in length.
   Red beets – before leaves emerge.

7. HOW TO APPLY:

   With: Ground equipment
   Rate: Flax – 1.82 kg/ac **(4.5 kg/ha)** in 40-60 L/ac **(100-150 L/ha)** of water.
   Rapeseed – 1.82 kg/ac **(4.5 kg/ha)** in 40-60 L/ac **(100-150 L/ha)** of water.
   Barley – 0.506 kg/ac **(1.25 kg/ha)** in 30-40 L/ac **(80-100 L/a)** of water. Oats – 0.506-1.113 kg/ac **(1.25-2.75 kg/ha)** in 30-40 L/ac **(80-100 L/ha)** of water.
   Field peas – 1.82 kg/ac **(4.5 kg/ha)** in enough water for even coverage.
   Sugar beets – 1.821 kg/ac **(4.5 kg/ha)** in 40 L/ac **(100 L/ha)** of water. In non-crop situations for control/suppression of:
   Quackgrass (established) – 44.5 kg/ac **(110 kg/ha)**
   Quackgrass (undisturbed soil) – 100-125 g/10m^2 applied in the fall.
   Quackgrass (in patches in cultivation) 75-90 g/10m^2 with thorough cultivation using plow or one-way disc.
   Grass suppression (stunting and prevention of seed production in Kentucky bluegrass, smooth bromegrass, crabgrass, green foxtail, etc.) 5.059-7.082 kg/ac **(12.5-17.5 kg/ha)** in enough water for even coverage.
   Control of conifers (spruce, balsam, pine) 20-25 kg in 1000 L of water applied to foliage until run off.
   Pavement maintenance (prior to surfacing) 2.5 kg/100m^2 applied before the prime coat. Pavement maintenance (existing pavement) 2.5 kg/100m^2 in enough water for even coverage.
   Water Volume: As above.
   Incorporation: Only applicable for quackgrass in patches in cultivation.
   Pressure: 275 kPa
   Ground Speed: 8-9 km/h
   Nozzles: Flat fan nozzles, with screens of at least 50 mesh.
   Protective Equipment: Standard protective clothing used when applying herbicides.

8. SPRAYING TIPS:

   (a) flush sprayer thoroughly after each use.
   (b) adequate agitation is needed during mixing to completely dissolve TCA.
   (c) stainless steel nozzle types are recommended.
   (d) when preparing spray solutions, ensure that 10 or more L of water are in the tank for each kg of NaTA.
   (e) when preparing tank mixes, ensure that NaTA is well dissolved before adding the other herbicide.
   (f) plant barley and oats at least 5 cm deep to avoid crop injury problem.

9. HOW IT WORKS: TCA is absorbed more readily through roots then foliage. It precipitates proteins within the plants which are essential for growth. It also disrupts membrane integrity.

10. EXPECTED RESULTS: Control symptoms include necrosis of leaves and drying of plant parts. Lightening of green coloration (chlorosis) is the first noticeable effect of green foxtail. Browning of the leaf tips, growth retardation and eventual death of the grass follows.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Conditions under which poor results may be expected:

1. Dry soil conditions.
2. Inadequate mixing and/or tank agitation.

11. EFFECTS OF RAINFALL: A light rainfall on newly treated soil is beneficial for activation, however, due to high water solubility, rain may wash NaTA off foliage.

12. MOVEMENT IN SOIL: Due to high water solubility, movement in light, sandy soils will be appreciable with adequate water movement.

13. GRAZING AND CROPPING RESTRICTIONS:

Grazing Restrictions: Do not feed tops of sugar or red beets to livestock. Do not allow animals to graze treated areas. Do not contaminate water bodies.

14. TOXICITY:

- chronic toxicity: no adverse effects noted in rats over 126 days with 1000 ppm (0.1%) in diet.
  Rats – oral LD_{50} = 3,320 mg/kg
  Chicks – oral LD_{50} = 4,280 mg/kg
  Rabbits – oral LD_{50} = 4,000 mg/kg
  Fish – LC_{95} = 10,000 ppm
- eye and dermal irritation: irritant to both eyes and skin.

15. PRECAUTIONS AND FIRST AID: Sodium TCA is a moderately toxic product which may cause burning on prolonged contact. Remove contaminated clothing and wash before reusing. Symptoms of poisoning are those expected with gastric irritation including vomiting, diarrhea and dizziness.

- If on skin, wash off with plenty of soap and water.
- If in eyes, wash with clear water for 15 minutes. Get medical attention.
- If swallowed, administer orally a neutralizer and diluent such as magnesium oxide, lime water, amphogel or soap solution. Five opiate for control of pain, keep patient warm and contact a physician.
- Take labelled container to doctor.

16. STORAGE: Keep in dry storage. Freezing will not affect NaTA.
A minimum of 2 years shelf life can be expected.

17. WHERE AVAILABLE: Federated Co-operatives, Niagara Chemicals, Alberta Wheat Pool, Oliver Chemicals, Pioneer Grain and United Grain Growers.

Additional information available from:

Hoechst Canada Inc.
295 Henderson Drive
Regina, Saskatchewan
S4N 6C2
Phone: (306) 924-1500

Hoechst Canada Inc.
109, 2915 – 21 St. N.E.
Calgary, Alberta
T2E 6Z1
Phone: (403) 230-2294

NEOBYNE 250 (barban)

1. FORMULATIONS: Emulsifiable concentrate 250 g/L
   Available in 20 L containers

2. REGISTERED MIXES: Do not mix with other herbicides.

   Mixing with other pesticides: Not recommended

3. CROPS: Barley, spring wheat**, rapeseed, mustard, flax, sunflower, peas (field and processing), fababeans, lentils, alfalfa, red clover, sweet clover, smooth bromegrass, timothy*, Russian wild ryegrass, creeping red fescue* and crested wheatgrass*.

   * Seed stand only.
   ** Including durum – Neobyne 250 is not recommended for use on "Park" variety

   Underseeding: Neobyne 250 can be used on the above underseeded to one or more of the above forage legumes and grass species.

4. WEEDS CONTROLLED: Wild oats

5. WEEDS SUPPRESSED: None

6. WHEN USED: When the majority of wild oats are in the 2 leaf stage but before the crop reaches the following growth stages:

Barley, lentils	Before the 4th leaf appears or before the 14th day after emergence.
Spring wheat	Before the 4th leaf appears or before the 14th day after emergence.
Flax	After the 2 (true) leaf stage but before the 12th leaf appears and before the 14th day after emergence.
Peas	Before the 6th leaf appears.
Forage legumes and grasses	Before the 4th leaf appears (NOTE: Timothy, creeping red fescue and crested wheat grass – seed stands and in year of seeding only)
Rapeseed, mustard, sunflower, fababeans	May be sprayed at any time the wild oats are in the 2 leaf stage.

7. HOW TO APPLY:

With:	Aircraft or ground equipment
Rate:	To all crops except wheat, apply 0.405-0.708 L/ac **(1.0-1.75 L/ha)** Neobyne 250. To spring wheat, apply 0.405 L/ac **(1.0 L/ha)** Neobyne 250. On all crops, use lower rate only under good growing conditions, when the wild oats have reached the 2 leaf stage in less than 10 days after emergence. Use the high rate on heavy infestations (535 or more wild oats plants/sq. m.), under poor growing conditions, or when wild oats have been injured by frost or wind.
Water Volume:	Aircraft: minimum 8 L/ac **(20 L/ha)** Ground equipment: 18 L/ac **(45 L/ha)**
Incorporation:	Not applicable
Pressure:	300 kPa (minimum)
Ground Speed:	6.5 km/h
Nozzles:	Tee Jet 650067, 730077, 80067 Monarch 20 and 22, Spray Jet 65.067 When wind velocity is 15-30 km/h use TK.75 or D.75 nozzles spaced at 100 cm on the boom.
Protective Equipment:	Standard protective equipment used when applying herbicides. – plus a face shield and apron when opening containers of Neobyne 250.

8. SPRAYING TIPS:

   (a) Always make sure the sprayer is thoroughly cleaned before spraying Neobyne 250. This is especially important in preventing carry over of MCPA or 2,4-D into rapeseed and mustard fields.
   (b) Wild oat seedlings will produce a new leaf every five days (with good to average growing conditions). Therefore, they will reach the 2 leaf stage 4-9 days after emergence.
   (c) Neobyne 250 contains an optimum blend of surfactants and wetting agents. Therefore, additional wetting agents and surfactants are not required in the spray tank.
   (d) Neobyne 250 can cause skin, eye and nose irritation. Avoid prolonged and direct contact of the chemical on the skin.
   (e) There are no restrictions on later application of other pesticides after the Neobyne 250 treatment. However, do not make a second application at a later date on grain crops.
   (f) Neobyne 250 should not be applied when plants are wet with dew or rain. Dew or rain 15 minutes after spray operations will not affect the activity of Neobyne 250.
   (g) To achieve good wild oat control with Neobyne 250, it is essential that the wild oat plants receive good coverage from the spray application. The required coverage can be obtained by: (h) Applying Neobyne 250 in 18 L/ac **(45 L/ha)** of water.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

(i) Operating the sprayer at 300 kPa to ensure a good break-up of the spray into fine droplets.
(j) Rotating the spray booms to direct the spray down and forward at a 45° angle.
(k) Boom heights should be adjusted 22-25 cm above the crop to give proper coverage.

9. HOW IT WORKS: Neobyne is a partially systemic herbicide (some translocation in plant) which penetrates the leaf and stem surfaces of the wild oat plant and interferes with cell division in the plant. Further development of the young seed head and new leaves is stopped shortly after the 2 leaf wild oat plant is treated. The first symptoms of Neobyne 250 action are a stoppage of new growth, followed by a change in the color and texture of the plant. The plant becomes brittle, the leaf tips turn brown and the plant eventually dies.

10. EXPECTED RESULTS:

Wild oats: An immediate stoppage of new growth, with the existing leaves gradually turning a blue-green color 7-10 days after application. At the same time a swelling of the stem at ground level may also be noted. The leaf tip will turn brown, the plant becomes brittle and eventually dies 3-4 weeks after treatment. The time required for these symptoms to appear and for the wild oat plant to die is affected by crop stand, growing conditions and soil fertility.

Crop: Neobyne 250 treatment will not affect the crop if used as directed.

Conditions under which poor results may be expected:

1. Rain within 15 minutes of application.
2. Too low an application rate of Neobyne 250 for existing conditions.
3. Inadequate spray coverage of the wild oat plant by lower than recommended sprayer pressure, incorrect spray nozzles and improper sprayer calibration.
4. Improper timing of Neobyne 250 application relative to the growth stage of the wild oat plants. Only the wild oat plants in the 2 leaf stage will be controlled.
5. Crop damage may occur if sprayed within 24 hours of a frost.

11. EFFECTS OF RAINFALL: Rainfall within 15 minutes of application may decrease control.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: The hazard from drift is low; only common oats, buckwheat and rye can be seriously affected by drift. Do not spray when winds exceed 30 km/h.
Grazing Restrictions: Do not graze or feed crop for 5 weeks after treatment. Do not feed flax straw or the lower 7.5 cm (stubble) of pea vines to livestock.
Crop Use After Hail: Do not use crop for 5 weeks after treatment.
Succeeding Crops: No restrictions.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 1,350 mg/kg (active ingredient)
  dermal LD_{50} rats = 2,300 mg/kg (active ingredient)
- **some people have become sensitized to Neobyne 250 after long-term exposure**
- very toxic to fish

15. PRECAUTIONS AND FIRST AID: Avoid prolonged contact with this product since it may cause skin sensitization.

- If on skin, wash off immediately with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, **do not induce vomiting**. Rush to hospital.
- Take labelled container to doctor.

16. STORAGE: At -40°C Neobyne 250 thickens but does not freeze.
The viscosity will return to normal as the temperature is increased. The good cold weather properties allow Neobyne 250 to be stored in unheated storage.

17. WHERE AVAILABLE: Cunningham Fertilizers Ltd.

Additional information available from:

Cunningham Fertilizers Ltd.
R.R. 1
Leduc, Alberta
T9E 2X1
Phone: (403) 985-3601

PARDNER (bromoxynil)

1. FORMULATIONS: Emulsifiable concentrate 225 g/L
   Available in 20 L containers

2. REGISTERED MIXES: Pardner + Atrazine
   Pardner + Avenge
   Pardner + 2,4-D
   Pardner + Hoe-Grass
   Pardner + MCPA
   Pardner + Roundup

3. CROPS: Spring wheat (including durum), winter wheat, fall rye (spring only) barley, oats, corn (field and sweet, tank mixed with atrazine or used alone), seedling grasses grown for seed production, in year of establishment not underseeded to legumes (brome grass, crested wheat grass, tall wheat grass, Russian wild rye, timothy, creeping red fescue, meadow fescue, reed canary grass), triticale.

   Underseeding: Not recommended

4. WEEDS CONTROLLED: Buckwheat (common, Tartary, wild), cocklebur, common groundsel, common ragweed, cow cockle*, lamb's-quarters*, mustard*, Russian thistle**, smartweeds (annual)*, stinkweed*, kochia**, velvetleaf (before plants are 8 cm high).

   * treat up to 4 leaf stage
   ** treat before 5 cm tall
   treat up to 8 leaf stage

5. WEEDS SUPPRESSED: Not applicable.

6. WHEN USED: Spray when weeds are in the seedling stage.

Cereals	– 2 leaf to early flag leaf (do not use tank mix with 2,4-D before 4 leaf stage of crop). Spring application only on winter wheat and fall rye.
Corn	– use alone or tank mixed with atrazine from 4 to 8 leaf stage – use alone with drop pipes after the 8 leaf stage
Seedling grasses	– 2 to 4 leaf stage

7. HOW TO APPLY:

With:	Ground equipment
Rate:	Cereals and Corn – used alone – 0.506-0.607 L/ac **(1.25-1.50 L/ha)** Corn – Pardner 0.506 L/ac **(1.25 L/ha)** + atrazine at 0.445-0.911 kg active/ac **(1.1-2.25 kg active ingredient/ha)** Flax and Seedling Grasses – 0.506 L/ac **(1.25 L/ha)** A 20 L container treats 39.5 ac (16 ha) at 0.506 L/ac **(1.25 L/ha)**
Water Volume:	Cereals – 40 L/ac **(100 L/ha)** Corn – 80-120 L/ac **(200-300 L/ha)** Seedling Grasses – 60 L/ac **(150 L/ha)**
Pressure:	275 kPa
Ground Speed:	Not over 10 km/h
Nozzles:	All standard nozzles delivering 40 L/ac **(100 L/ha)** Flooding type are not recommended.
Protective Equipment:	Standard protective clothing used when applying herbicides. - plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS: Spray when weeds are in the seedling stage.

   Triticale: Pardner is recommended at the 0.506-0.607 L/ac **(1.25-1.50 L/ha)** rates for use at 2 leaf to early flag leaf stage of the crop.

   Corn (field and sweet): Pardner may be used at the 0.506-0.607 L/ac **(1.25-1.5 L/ha)** rate as an overall spray when the corn is in the 4-8 leaf stage. To ensure adequate coverage of weeds, drop pipes should be used when corn is beyond the 8 leaf stage or for a second application. Temporary crop damage (leaf scorching) may occur in adverse conditions, especially if applied during or after periods of wet, or hot and humid weather. Do not add oil or surfactant.

   Pardner at the 0.506 L/ac **(1.25 L/ha)** rate plus atrazine at 0.445-0.911 kg active ingredient/ac **(1.1-2.25 kg active ingredient/ha)** is recommended at the 4-8 leaf stage of the corn. Add atrazine to the tank first, mix well, then add Pardner. Do not add oil or surfactant.

   Seedling Grasses (not underseeded to a legume in the year of establishment): Pardner at the 0.506 L/ac **(1.25 L/ha)** rate may be applied to the listed seedling grasses at the 2 to 4 leaf stage in 60 L/ac **(150 L/ha)** of water.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

9. HOW IT WORKS: Pardner is a contact type herbicide, therefore, good spray coverage is essential. It inhibits plant photosynthesis and respiration.

10. EXPECTED RESULTS: Within a few hours or several days, depending on the weather, small areas of burnt tissue will appear on the leaves of the weeds. Complete death of the weeds will be evident in 1-2 weeks.

    Conditions under which poor results may be expected:
    1. Poor spray coverage.
    2. Using less than the recommended rate.
    3. Spraying flax when plants are non-vigorous or under stress or in periods of hot, humid weather may cause crop damage.
    4. Spraying after the recommended growth stage of the weeds.
    5. Applying after the crop shields the weeds.

11. EFFECTS OF RAINFALL: No effect

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS: No grazing or crop use restrictions, except those due to atrazine when Pardner + atrazine tank mix is used.

14. TOXICITY:

    - has slightly high acute mammalian toxicity
      oral LD_{50} rat = 365-440 mg/kg
    - no short-term or long-term human health problems have been associated with this product.
    - non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale spray mist.

    - If on skin, wash off with soap and water.
    - If in eyes, wash with water for 15 minutes and get medical attention.
    - If swallowed, **do not induce vomiting.** See a doctor immediately.
    - Take labelled container to doctor.

16. STORAGE: Store in heated area. Pardner may crystallize if frozen.
    If crystallization has taken place, warm the drum in a warm room or sun with frequent agitation until crystals are dissolved.

17. WHERE AVAILABLE: Alberta Wheat Pool, Oliver Agricultural Supply, Pioneer Grain, Cargill Grain, Chipman Inc.

    Additional information available from:

    May & Baker Canada Ltd.
    1865 Sargent Avenue
    Bay No. 2
    Winnipeg, Manitoba
    R3H OE4
    Phone: (204) 774-1819

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

PATORAN (metobromuron)

1. FORMULATIONS: 50% Wettable Powder (Patoran 50 WP)
Available in 2.75 kg bags.
670 g/L Flowable (Patoran 670 FW)
Available in 20 L pails.
400 g/L Flowable (Patoran FL)
Available in 10 L pails.

2. REGISTERED MIXES: Patoran 670 FW + Dual Ciba-Geigy
Patoran 50 WP + Dual Ciba-Geigy

3. CROPS: Potatoes, soybeans, lima beans, adzuki beans, dry common beans, snap common beans.

4. WEEDS CONTROLLED: Annual bluegrass, barnyard grass, chickweed, corn spurry, green foxtail, groundsel, lamb's-quarters, mustard, pigweeds, purslane, ragweed, shepherd's-purse, smartweeds (annual), stinkweed.

5. WEEDS SUPPRESSED: Annual grasses.

6. WHEN USED:

- Apply as a pre-emergent spray (after planting but prior to emergence of crop and weeds).
- Patoran 670 FW or 50 WP can be applied either as:

1. A pre-emergent spray in tank mix combination with Dual Ciba-Geigy.
2. A pre-emergent spray preceded by a pre-plant incorporated spray of Dual Ciba-Geigy.

7. WHEN USED:

With: Ground equipment

Rate:

Crop	50 WP kg/ac (kg/ha)	670 FW kg/ac (L/ha)	FL kg/ac (L/ha)
Potatoes	1.315-2.226 **(3.25-5.5)**	1.012-1.72 **(2.5-4.25)**	1.72-3.44 **(4.25-8.5)**
Soybeans	1.315-1.821 **(3.25-4.5)**	1.012-1.315 **(2.5-3.25)**	1.72-2.226 **(4.25-5.5)**
Adzuki beans	1.113-2.023 **(2.75-5.0)**	0.809-1.72 **(2-4.25)**	1.72-2.226 **(4.25-5.5)**
Other beans	1.113-2.023 **(2.75-5.0)**	0.809-1.72 **(2.0-4.25)**	1.416-1.72 **(3.5-4.25)**

Do not use on the bean variety "Slim Green". Use a lower rate for the bean varieties "Yellow Eye", "Cranberry", "White Kidney", "Light-red Kidney", and "Dark-red Kidney" as given on the individual labels.
Rate used depends on soil type. Consult the rate table on the label of the Patoran used.
Consult the Dual Ciba-Geigy 960E label for registered tank mix rates.
At 1.113 kg/ac **(2.75 kg/ha)** rate, one Patoran 50 WP 2.75 kg bag will treat 2.471 ac (1 ha).

Water Volume: 70-140 L/ac **(170-350 L/ha)** with Patoran 670 FW. 120-160 L/ac **(300-400 L/ha)** with Patoran 50 WP. 100-160 L/ac **(250-400 L/ha)** with Patoran FL.

Incorporation: Do not soil-incorporate Patoran.

Pressure: 275 kPa

Ground Speed: 9 km/h

Nozzles: Use nozzles capable of delivering 70-160 L/ac **(170-400 L/ha)** in a uniform pattern at a pressure of 275 kPa. Nozzle screens should be 50 mesh size or larger. When using Patoran 50 WP, use nozzles capable of delivering 120-160 L/ac **(300-400 L/ha)**.

Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a respirator and goggles when opening bags of Patoran WP.
- plus a face shield and apron when opening pails of Patoran flowable.

8. SPRAYING TIPS:

(a) Do not let spray tank contents stand for prolonged periods of time without agitation. Agitate thoroughly before recommencing operations.
(b) Keep by pass line on or near the bottom of spray tank.
(c) Do not apply Patoran to coarse textured soils low in organic matter. Do not use on sandy soil of less than 2% organic matter.

9. HOW IT WORKS: Patoran is a systemic herbicide which is absorbed through the root system and once in the plant its mode of action is to strongly inhibit photosynthesis.

10. EXPECTED RESULTS: Applied as a pre-emergence spray, weed emergence should be inhibited or totally absent. Under dry conditions, some weed emergence and early die back can occur. The product is moisture dependent, so a light cultivation may be necessary to put the product in contact with moist soil.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

11. EFFECTS OF RAINFALL: None specified.

12. MOVEMENT IN SOIL: Patoran can be leached on light soils.

13. GRAZING AND CROPPING RESTRICTIONS: None specified.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 5,000 mg/kg
  dermal LD_{50} rats = 2,000 mg/kg
- not a skin sensitizer
- no short-term or long-term human health problems are associated with this product
- non-toxic to fish and birds; slightly toxic to bees

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes, and do not inhale dust or spray mist.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container to doctor.
- Take the information in this booklet on Patoran with you to doctor.

FOR PHYSICIAN: Gastric lavage with water or potassium permanganate solution 1:5000. Leave a solution of magnesium of sodium sulphate (15-30 g in water) in the stomach. Treat shock cautiously because of the uncertain cardiac status. Administer oxygen and apply artificial respiration if necessary. Transfusion of whole blood or washed red cells in saline may be advisable. Give stimulants or sedatives according to symptoms. Methylene blue (1% solution) 1 to 2 mg/kg i.v. or, in less severe cases, of methaemoglobinaemia 50 mg/kg orally.

16. STORAGE: Patoran 670 FW and Patoran FL are freezable and should be kept in warm storage if possible. If product freezes allow to warm up at room temperature then thoroughly agitate in order to reconstitute prior to use.

17. WHERE AVAILABLE: Green Cross Product Dealers.

Additional information available from:

Green Cross Products
820 – 26 Street N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario
M9W 1K1
Phone: (416) 675-3611

PHENOXYLENE PLUS

1. FORMULATIONS: 250 g/L present as sodium and potassium salts of MCPA
   Available in 20 L containers.

2. REGISTERED MIXES: Phenoxylene + TCA

   Mixing Restrictions: Ensure that the proper formulation of MCPA is used with the product considered for mixing.
   Mixing with other Pesticides: Not recommended.

3. CROPS: Wheat, barley, rye, oats, flax, potatoes, peas, pastures, lawns, fairways, and non-cropland.

   Underseeding: Apply when crop canopy protects the legumes from the spray.

4. WEEDS CONTROLLED: Annual sow-thistle, bluebur, buttercup, common chickweed, cocklebur, common plantain, curled dock, dandelion, flixweed, goat's-beard, hoary cress, kochia, lamb's-quarters, mustards (ball, dog, hare's-ear, tansy, tumble, wild), pepper grass, prickly lettuce, ragweed, redroot pigweed, Russian pigweed, shephard's-purse, smartweed, stinkweed, tumbleweed.

5. WEEDS SUPPRESSED: Blue lettuce, buckwheat (tall, Tartary, wild), Canada thistle, field bindweed, hemp-nettle, horsetail, leafy spurge.

6. WHEN USED:

   Crop Stage:
   Spring wheat, barley, oats – Emergence to just before flag leaf.
   Flax – From 5 cm to just before bud formation.
   Peas – When peas are 10-18 cm tall but before flower bud formation.
   Pastures – Early summer.
   Potatoes (Table stock only) – Apply as soon as weeds appear but before potatoes emerge.
   Lawns and Fairway – Apply to actively growing weeds.

7. HOW TO APPLY:

   With: Ground equipment or aircraft.
   Rate:

	Phenoxylene Plus	
Crop	L/ac	**(L/ha)**
Wheat, Barley,	0.61-1.42	**(1.5-3.5)**
Flax, Rye, Oats Potatoes	0.61-0.81	**(1.5-2.0)**
Peas	0.36-0.61	**(0.9-1.5)**
Pastures Containing Clover	0.61-0.71	**(1.5-1.75)**
Late Maturing Alfalfa	0.61	**(1.5)**
Lawns and Fairways	1.82	**(4.5)**
Non Cropland and Rough Grass Pastures Up To	2.83	**(7.0)**

   NOTE: Higher rates are recommended for hard-to-kill weeds may cause crop damage.

   Water Volume: Aircraft – minimum 8 L/ac **(20 L/ha)**
   Ground Equipment – 40 L/ac **(100 L/ha)**
   Incorporation: Not applicable
   Pressure: 275 kPa or less
   Ground Speed: 9 km/h
   Nozzles: All standard and low pressure nozzles delivering 40 L/ac **(100 L/ha)**
   Protective Equipment: Standard protective equipment used when applying herbicides.

8. SPRAYING TIPS:

   (a) Drift from spray can be reduced by using high volume sprays under low pressure, coarse sprays and drop nozzles.
   (b) Do not spray during windy conditions or when air temperature is above 27°C.
   (c) Do not spray if rain is expected within 6 hours.
   (d) Avoid spray drift to sensitive crops.
   (e) Extremely hard water may reduce performance or cause problems in spraying.
   (f) Application before or after recommended stage may result in crop injury.

9. HOW IT WORKS: MCPA is a systemic herbicide which is absorbed by all leaf and stem surfaces. It is translocated throughout the plant and concentrates in the actively growing region of the plant. MCPA disrupts cell division, causing abnormal growth response, as well as affecting respiration and food reserves. This is followed by twisting of the weeds and their eventual death.

10. EXPECTED RESULTS:

    Weeds: Weeds start to show twisting effects between 2-10 days after spraying, depending on weather conditions, formulation and weeds. Following the twisting and bending, plants will turn brown and then die. Only those weeds that are emerged at time of spraying will be controlled.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Crops: Yellowing and thinning of the crop may be noticed if higher than recommended rates are applied. Generally speaking, MCPA is easier on the crop than is 2,4-D.

Conditions under which poor results may be expected:
1. Rain within 6 hours of application.
2. Use of extremely hard water in the spray tank.

11. EFFECTS OF RAINFALL: Rain within 6 hours of spraying will decrease activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is lower than from ester or amines but avoid drift onto susceptible crops such as rapeseed, mustard, sunflowers, potatoes, shelterbelts and gardens.

Grazing Restrictions: Do not graze dairy cattle within 7 days after spraying.

14. TOXICITY:

Fish and Wildlife:
Rat LD_{50} = 800 mg/kg
Bluegill LD_{50} for 48 hours = 1.5 mg/L

15. PRECAUTIONS AND FIRST AID: Causes irritation of skin and eyes.

- If on skin, wash off immediately with soap and water.
- If in eyes, wash with clean water for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Get prompt medical attention.
- Take labelled container to doctor.

16. STORAGE: If the product was stored under freezing conditions warm to 5°C and mix well before using.

17. WHERE AVAILABLE: Niagara Dealers.

Additional information available from:

Niagara Chemical, Division of Reichhold Ltd.
1274 Plains Road E.
P.O. Box 5004
Burlington, Ontario
L7R 3Z1
Phone: (416) 634-2355

POAST (sethoxydim)

1. FORMULATIONS: Liquid, emulsifiable containing 184 g/L active ingredient.
   Available in 7 L containers.

2. REGISTERED MIXES: Assist Oil Concentrate must be added to all applications of Poast.
   Poast + Buctril M or Brominal M or Bromox 450.
   Poast + MCPA (amine or ester formulations).

   Use mixture on Flax only.

3. CROPS: Rapeseed (canola), flax, soybeans and sugar beets.

4. WEEDS CONTROLLED: Annual grasses (wild oats, foxtails, volunteer cereals and other grasses).

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Post-emergence

7. HOW TO APPLY:

With:	Ground equipment or by air.
Rate:	0.324-0.768 L/ac **(0.8-1.9 L/ha)**
Water Volume:	20-40 L/ac **(50-100 L/ha)** – except for very dense weed infestations or to dense crop canopies 45-80 L/ac **(110-200 L/ha)**. Aerial application 14-20 L/ac **(35-50 L/ha)**.
Incorporation:	Not applicable
Pressure:	275-425 kPa
Ground Speed:	9 km/h
Nozzles:	Use of 80° stainless steel flat fan nozzles is recommended for optimum spray coverage. The use of flood jet or hollow cone nozzles is not recommended.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of Poast liquid.

8. SPRAYING TIPS: Tilt nozzles forward 45° to ensure better coverage.
   Treat when weedy grasses are at 1-6 leaf stage, actively growing, there is good soil moisture and the crop is small enough to permit thorough spray coverage.

Grass Species Controlled	Optimum Size Leaf Stage	Grass Plant Height	Product Rate
Green and yellow foxtail, barnyard grass, proso millet, fall panicum, witch grass, persian darnel.	1-6	10-15 cm	0.324 L/ac **(0.8 L/ha)**
	For extremely heavy infestations 0.405 L/ac		**(1.0 L/ha)**
Above weeds plus wild oats.	1-6	10-15	0.567 L/ac **(1.4 L/ha)**
	For extremely heavy infestations 0.648 L/ac		**(1.6 L/ha)**
Above weeds plus volunteer wheat and volunteer oats.	1-6	10-15	0.648 L/ac **(1.6 L/ha)**
Above weeds plus volunteer barley.	1-6	10-15	0.769 L/ac **(1.9 L/ha)**

Assist Oil Concentrate must be added to all applications of Poast.

Required Water Volume	Required Amount of Assist
20-45 L/ac **(50-110 L/ha)**	0.202 L/ac **(0.5 L/ha)**
45-100 L/ac **(110-250 L/ha**	0.809 L/ac **(2 L)**
Aerial application 45 L/ac **(Aerial application 110 L/ha)**	0.202-0.404 L/ac **(0.5-1.0 L/ha)**

Mixing Instructions:
Half fill clean spray tank with clean water.
Start agitator.
Add correct amount of Poast.
Add broadleaf herbicide.
Add Assist oil concentrate.
Agitate for 2-3 minutes.
Fill tank with water.
After any break in spraying operations, agitate thoroughly before beginning to spray.
Avoid allowing any spray to sit overnight.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Thoroughly clean the sprayer after use by flushing with water and detergent.
Allow 4 days between the application of Poast and any other chemical.

9. HOW IT WORKS: Poast is a contact and a systemic herbicide. Uptake into the plant is primarily through the leaves. Thorough coverage of the foliage is important for consistent grass control.

   In wide row crops (25 cm or more in width) such as soybeans and sugar beets where the crop canopy may be slow to close, cultivation may be necessary to control annual grasses that emerge after treatment. Allow a minimum of 4 days between treatment and cultivation.

10. EXPECTED RESULTS: Once treated, susceptible grasses that were actively growing prior to treatment stop growing immediately and undergo a slow burn-back and colour change to first yellowish, then a purplish and finally a brown colour. The time required for complete control is normally 7 to 21 days following treatment, depending on growing conditions and crop competition.

    Conditions under which poor results may be expected:
    1. Use only for crops listed on this label.
    2. When grasses are stressed due to drought, flooding or prolonged cool temperatures (15°C or less), control can be reduced or delayed since grasses are not actively growing. Grass escapes or re-tillering may occur under prolonged stress conditions. DO NOT MAKE APPLICATIONS TO GRASSES STRESSED LONGER THAN 20 DAYS DUE TO LACK OF MOISTURE AS UNSATISFACTORY CONTROL CAN RESULT. Thorough pre-plant tillage operations are required to fields where sod or forage grass crops may have grown the previous year.
    3. Do not mix or apply Poast with any other additive, pesticide or with fertilizer except as specifically recommended on this label.
    4. Allow 4 days between application of Poast and any other chemical.

11. EFFECTS OF RAINFALL: Rainfall within one hour of application may reduce the effectiveness of the spray.

12. MOVEMENT IN SOIL:

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Injury to grass (forages), cereal or corn crops and turf may occur if Poast is applied on or too close to these susceptible crops. Do not apply when weather conditions may cause spray drift from treated fields to adjacent crops. Wash sprayer thoroughly after use to avoid damage to the next crop sprayed, especially if it is a cereal, forage or corn crop.

    Grazing Restrictions: Do not graze treated fields or harvest for feed prior to crop maturity.

    Succeeding Crops: No restriction.

14. TOXICITY:

    - has very low acute mammalian toxicity

    Technical Material
    oral LD$_{50}$ rats = 2,676 mg/kg
    oral LD$_{50}$ mice = 5,600 mg/kg
    dermal LD$_{50}$ rats = greater than 5,000 mg/kg
    dermal LD$_{50}$ mice = greater than 5,000 mg/kg
    - low toxicity to birds, fish and bees (sethoxydin)
    - hazards to the environment are low because of rapid breakdown in soil.

    Formulated Material
    oral LD$_{50}$ rats = 2,500 mg/kg
    dermal LD$_{50}$ rats = 4,000 mg/kg
    4-hour inhalation LC$_{50}$ = 700 mg/m^3 air
    - causes moderate skin and eye irritation

15. PRECAUTIONS AND FIRST AID: Take all necessary precautions to prevent eye and skin exposure to this product.

    - If on skin, wash off immediately with soap and water.
    - If in eyes, wash with clean water for 15 minutes and get medical attention. **Do not delay.**
    - If swallowed, **do not induce vomiting.** Get immediate medical attention.
    - Take labelled container to doctor.

16. STORAGE: Store product in a cool, dry place.

17. WHERE AVAILABLE:

Additional information available from:

BASF Canada Inc.
10 Constellation Court
Rexdale, Ontario
M9W 1K1

BASF Canada Inc.
Norcen Tower, Ste. 1705
715 – 5 Avenue, S.W.
Calgary, Alberta
T2P 2X6
Phone: (403) 263-2652

PRIMATOL (atrazine)

1. FORMULATIONS: 80% wettable powder
   Available in 25 kg drums
   Water soluble liquid containing 500 g/L of technical atrazine.
   Available in 10 L containers.

2. REGISTERED MIXES: Primatol + diuron + simazine
   Primatol + 2,4-D (acid)
   Primatol + 2,4-D (amine)
   Primatol + paraquat
   Primatol + simazine

3. CROPS: Total weed control and bare ground maintenance on non-crop land.

4. WEEDS CONTROLLED: Most annual and perennial broad-leaf weeds and grasses that are found on non-crop land. Weeds such as horsetail and milkweed may require more than one treatment to give effective control.

5. WEEDS SUPPRESSED:

6. WHEN USED: April and May OR August to freeze-up.
   NOTE: Spring application in the Prairies and Interior B.C. can be extended into June, sometimes July, if rainfall and soil moisture are plentiful.

7. HOW TO APPLY:

   With: Equipment that will apply up to 890 L/ac **(2,200 L/ha)**.
   Rate: 8.9-18.2 L/ac **(22-45 L/ha)** (liquid) or 5.75-11.5 kg/ac **(14.2-28.4 kg/ha)** (WP)
   Water Volume: 90-890 L/ac **(225-2,200 L/ha)** – as required for adequate coverage of ground surface.
   Incorporation: Not applicable
   Pressure: 210-315 kPa
   Ground Speed: Sufficient for good coverage
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a respirator and goggles when opening drums of Primatol wettable powder.
   – plus a face shield and apron when opening containers of Primatol liquid.

8. SPRAYING TIPS: Provide gentle agitation during mixing and spraying and especially after any break in spray operations. Do not use nozzle screens or line strainers finer than 50 mesh size. The by-pass line should discharge at the bottom of the tank.

9. HOW IT WORKS: Primatol is a formulation of atrazine that is taken up mainly by weed roots but there may be also some herbicidal effect by absorption through foliage. The triazine herbicides are potent inhibitors of the Hill reaction, ie: they are photosynthetic inhibitors. Triazines also affect the uptake of nutrients and changes in the nitrogen metabolism seem to occur.

10. EXPECTED RESULTS: Failure of weeds to emerge or, depending on weather conditions, weeds may die back soon after emergence.

11. EFFECTS OF RAINFALL: Average to moderate rainfall can enhance performance. Very heavy rainfall on sandy soils can cause some leaching and thus a decrease in efficacy.

12. MOVEMENT IN SOIL: Although of low solubility Primatol liquid tends to penetrate well into the soil and it may creep to some extent, especially on sloping ground.

13. GRAZING AND CROPPING RESTRICTIONS: Not applicable. For use on non-crop land – trees, ornamentals, or crops are likely to be damaged if their roots extend into the treated zone.

14. TOXICITY:

    - has very low acute mammalian toxicity
      oral LD_{50} rats = 3,080 mg/kg (active ingredient)
      oral LD_{50} mice = 1,750 mg/kg (active ingredient)
    - not a skin sensitizer
    - may cause eye irritation
    - no short-term or long-term human health problems are associated with Primatol

15. PRECAUTIONS AND FIRST AID: May cause eye irritation. Use of goggles recommended.

    - If on skin, wash off with soap and water.
    - If in eyes, wash off immediately with water for 15 minutes and get medical attention. Do not delay.
    - Avoid breathing dust or spray mist.
    - If Primatol liquid is swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.

- Take labelled container to doctor.
- Take the information on this herbicide in this booklet with you to doctor.

FOR PHYSICIAN: If atrazine is ingested accidentally, there is no specific antidote. Induce emesis or lavage stomach. Give a saline laxative and supportive therapy.

16. STORAGE: In a dry location.

17. WHERE AVAILABLE: Midland Vegetation Control Inc.

Additional information available from:

Ciba-Geigy Canada Ltd.
6860 Century Avenue
Mississauga, Ontario
L5N 2W5
Phone: (416) 836-9445

PRIMEXTRA (metolachlor + atrazine)

1. FORMULATIONS: Flowable formulation containing 300 g/L metolachlor + 190 g/L atrazine + 10 g/L related active triazines. Available in 10 L containers.

2. REGISTERED MIXES: Nitrogen fertilizer solutions may replace all or part of the water as a carrier. Dry bulk granular fertilizers may be impregnated with Primextra.

3. CROPS: Corn crops – seed, hybrid grain, silage and sweet corn.

4. WEEDS CONTROLLED: Primextra controls germinating annual grasses such as: barnyard grass, foxtail (giant, green, yellow), and witch grass; as well as broad-leaf weeds such as: annual smartweeds, lamb's-quarters, purslane, pigweed (prostrate, redroot), ragweed, wild buckwheat and wild mustard.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Primextra is a spring applied, pre-plant incorporated herbicide, or as a band treatment.

7. HOW TO APPLY:

With: Ground equipment such as standard field sprayer, Big A, Terra-gator, etc.
Rate: 2.7-3.44 L/ac **(6.7-8.5 L/ha)** [At 2.7 L/ac **(6.7 L/ha)** rate, one 20 L container will treat 7.2 ac (2.9 ha)].
Water Volume: 60-120 L/ac **(150-300 L/ha)**
Incorporation: Apply Primextra as a broadcast treatment and incorporate thoroughly into the top 5 cm of soil prior to planting. Do not exceed this depth of incorporation. Tandem discs or Danish cultivators with tines on 15-20 cm centres followed by a spike toothed, rolling or western harrow are recommended for incorporation. As a band treatment, use a suitable press wheel mounted ahead of the nozzle in order to level the band.
Pressure: 200-300 kPa
Ground Speed: 10-13 km/h
Nozzles: Standard spray nozzles designed to deliver recommended rates at low to medium pressure ensuring good coverage and a minimum of drift.
Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening containers of Primextra.

8. SPRAYING TIPS: Primextra must be mixed with clean water. Prepare the spray by adding Primextra to the tank while filling with water. Provide gentle agitation during filling, mixing and spraying. Use 50 mesh nozzle screens. Some dry bulk granular fertilizers may be impregnated with Primextra Liquid for preplant, incorporated application. Consult the product label for instructions and restrictions.

9. HOW IT WORKS: Primextra acts mainly through the roots of germinating weeds and inhibits photosynthesis.

10. EXPECTED RESULTS: High percentage of control on annual grasses expressed by lack of germination or die-back soon after the seedling emerges. This "post-kill" situation is more common under fairly dry conditions and can be variable since metolachlor requires moisture to perform at its best.

11. EFFECTS OF RAINFALL: Enhances treatment

12. MOVEMENT IN SOIL: Negligible

13. GRAZING AND CROPPING RESTRICTIONS: Corn followed by corn only.

14. TOXICITY:

- has very low acute mammalian toxicity
  metolachlor + atrazine: oral LD_{50} rats = 3,094 mg/kg
  dermal LD_{50} rats = 3,100 mg/kg
  4-hour inhalation LC_{50} = 700 mg/m^3 air
- **may cause severe skin and eye irritation and perhaps eye damage with prolonged eye exposure**
- **may cause skin sensitization**
- low toxicity to fish and birds

15. PRECAUTIONS AND FIRST AID: Take all necessary precautions to prevent eye and skin exposure to this product.

- If on skin, wash off immediately with soap and water.
- If in eyes, wash with clean water for 15 minutes and get medical attention. **Do not delay.**
- If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Primextra will freeze but will return to liquid state at room temperature (15-22°C). If possible store in dry, warm locations.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE: Green Cross Product Dealers.

Additional information available from:

Green Cross Products
820 – 26 Street N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

PRINCEP/SIMADEX (simazine)

1. FORMULATIONS: Princep 4G (granular) – 3.8% simazine + 2% related triazines.
   Available in 4.5 kg containers.

   Princep Nine-T (water dispersible granule) – 87.6% simazine + 2.4% related triazines.
   Available in 4.5 kg containers.

   Simadex 80W (wettable powder) – 80% simazine.
   Available in 2 kg containers.

   Simadex Flowable (liquid) – 500 g/L simazine.
   Available in 5 L containers.

2. REGISTERED MIXES: None

3. CROPS: Apples, pears, strawberries, loganberries, raspberries, high bush blueberries, blackberries, shelterbelts, established woody ornamentals and nursery stock, forest and Christmas tree plantings, established alfalfa, established bird's-foot trefoil, corn (field and sweet), and asparagus.
   OTHER USES: Aquatic weed control (restricted use) and total vegetation control on farms and non-crop land.

4. WEEDS CONTROLLED: Princep and Simadex control both broad-leaf and grassy weeds, including lady's-thumb, lamb's-quarters, purslane, ragweed, clovers, wild buckwheat, smartweed, barnyard grass, crabgrass, wild oats, yellow foxtail, and many seedling perennial weeds.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Princep and Simadex should be used prior to or during weed emergence and may be applied in either the spring or fall.

7. HOW TO APPLY:

With: Ground equipment such as the standard field or farm sprayer when using Princep Nine-T, Simadex 80W and Simadex Flowable and a Cyclone spreader or other suitable mechanical applicator when using the Princep 4G formulation.

Rate: *Princep 4G*
Established nursery stock: 22.26-34.4 kg/ac **(55-85 kg/ha)** in fall or spring.
Shelterbelts: 44.5-70.8 kg/ac **(110-175 kg/ha)** in the fall.
Forest and Christmas trees: 44.5-70.8 kg/ac **(110-175 kg/ha)**.
Total vegetation control on farms (spot treatment) 5.5-7.5 kg/100 m^2.

Princep Nine-T
Apples and Pears: 1.01-2.02 kg/ac **(2.5-5 kg/ha)**
Loganberries: 1.518-2.428 kg/ac **(3.75-6.0 kg/ha)**
Raspberries: 0.809-1.01 kg/ac **(2-2.5 kg/ha)**
High bush blueberries: 1.01-1.518 kg/ac **(2.5-3.75 kg/ha)** to base of plants in early spring.
Blackberries: 1.01-1.518 kg/ac **(2.5-3.75 kg/ha)** to base of plants in early spring.
Asparagus: established plantings only, 1.01-1.518 kg/ac **(2.5-3.75 kg/ha)**.
Woody ornamentals and nursery stock: 1.01-1.518 kg/ac **(2.5-3.75 kg/ha)**.
Shelterbelts: 2.02-3.03 kg/ac **(5-7.5 kg/ha)**.
Forest and Christmas tree plantings: 2.02-2.833 kg/ac **(5-7 kg/ha)** of ground treated. (Consult chart on label).
Established alfalfa: 0.445 kg/ac **(1.1 kg/ha)** (fall treatment only).
Established bird's-foot trefoil: 0.445 kg/ac **(1.1 kg/ha)** (fall treatment only).
Corn: 0.607-1.01 kg/ac **(1.5-2.5 kg/ha)**.
Aquatic vegetation control: Restricted uses, consult label.

Simadex 80W and Simadex Flowable
Apples and Pears: 1.113-2.226 kg/ac **(2.75-5.5 kg/ha)** 80W, 1.82-3.64 L/ac **(4.5-9.0 L/ha)** Flowable.
Established loganberry: 1.72-2.73 kg/ac **(4.25-6.75 kg/ha)** 80W, 2.71-4.37 L/ac **(6.7-10.8 L/ha)** Flowable.
Established raspberries: 0.91-1.113 kg/ac **(2.25-2.75 kg/ha)** 80W, 1.457-1.82 L/ac **(3.6-4.5 L/ha)** Flowable.
Strawberries: new plantings established at least six weeks, 0.91 kg/ac **(2.25 kg/ha)** 80W, 1.457 L/ac **(3.6 L/ha)** Flowable.
Established asparagus: 1.113-1.72 kg/ac **(2.75-4.25 kg/ha)** 80W, 1.82-2.71 L/ac **(4.5-6.7 L/ha)** Flowable.
Woody ornamentals and nursery stock: established one year or more, 1.113-1.72 kg/ac **(2.75-4.25 kg/ha)** 80W, 1.82-2.71 L/ac **(4.5-6.7 L/ha)** Flowable.
Shelterbelts: established one growing season or more, 2.347-3.44 kg/ac **(5.5-8.5 kg/ha)** 80W, 3.64-5.46 L/ac **(9.0-13.5 L/ha)** Flowable.
Forest and Christmas tree plantings: 2 year stock or older, 2.347-3.44 kg/ac **(5.5-8.25 kg/ha)** 80W, 3.64-5.46 L/ac **(9.0-13.5 L/ha)** Flowable.
Established bird's-foot trefoil: 0.607 kg/ac **(1.5 kg/ha)** 80W, 0.89 L/ac **(2.2 L/ha)** Flowable (fall treatment only).

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

	Corn: 0.809-1.113 L/ac **(2-2.75 kg/ha)** 80W, 1.295-3.238 L/ac **(3.2-8.0 L/ha)** Flowable. Industrial: for total weed control and bare ground maintenance on non-crop land, consult the label for rates. Aquatic vegetation control: restricted uses, consult label.
Water Volume:	120 L/ac **(300 L/ha)** for Princep Nine-T and Simadex Flowable except 200 L/ac **(500 L/ha)** for shelterbelts. 140 L/ac **(350 L/ha)** for Simadex 80W except 220 L/ac **(550 L/ha)** for shelterbelts.
Incorporation:	In corn, Princep and Simadex may be applied one week before seeding and incorporated to a depth of 2.5 cm.
Ground Speed:	Dependent on crop and type of application.
Nozzles:	Standard spray nozzles designed to deliver recommended rates at low to medium pressure ensuring good coverage.
Pressure:	275 kPa
Protective Equipment:	Standard protective clothing used when applying herbicides. - plus a respirator and goggles when opening bags of Princep 4G, Princep Nine-T, and Simadex 80W. - plus a face shield and apron when opening containers of Simadex Flowable.

8. SPRAYING TIPS:

Princep Nine-T –
(a) Gentle agitation required during mixing and spraying of the Nine-T, dispersible granule.
(b) Use nozzle screens of 50 mesh size or larger.
(c) After any break in the spray application, agitate thoroughly.

9. HOW IT WORKS: Princep and Simadex act through the roots of germinating weeds and inhibit photosynthesis.

10. EXPECTED RESULTS: Weed free treated ground.

11. EFFECTS OF RAINFALL: Negligible

12. MOVEMENT IN SOIL: Very little movement is possible on clay soil types but on sandy ground with high rainfall some leaching can occur.

13. GRAZING AND CROPPING RESTRICTIONS: Allow 30 days between application and grazing of dairy, beef cattle, and sheep and 60 days between application and cutting for hay. After spraying with Princep Nine-T, Simadex 80W or Simadex Flowable do not plant any crop in the treated area in the same year except corn.

14. TOXICITY:

- has very low acute mammalian toxicity
  - oral LD_{50} rats = 5,000 mg/kg (technical)
  - dermal LD_{50} rabbits = 10,200 mg/kg (simazine 80W)
- may be irritating to eyes and skin
- **may cause skin disease (dermatitis)**
- no short-term or long-term human health problems are associated with Simazine after over 18 years of use
- not a skin sensitizer

15. PRECAUTIONS AND FIRST AID: Prevent skin and eye exposure to this product. Use all safety measures possible. Do not inhale dust.

- If on skin, wash off **immediately.**
- If in eyes, wash with clean water for 15 minutes and get medical attention. **Do not delay.**

FOR PHYSICIAN: If Simazine is ingested accidentally there is no specific antidote. Induce emesis or lavage stomach. Give a saline lazative and supportive therapy.

16. STORAGE: Store in dry area, heating not required.

17. WHERE AVAILABLE: Green Cross Product Dealers.

Additional information available from:

Green Cross Products
820 – 26 Street N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

FBC Chemicals Canada Inc.
80 Melford Drive
Scarborough, Ontario
M1B 2G3
Phone: (416) 292-8700

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

PYRAMIN (pyrazon)

1. FORMULATIONS: Flowable formulation containing 470 g/L of pyrazon in 3 L jugs.

2. REGISTERED MIXES: Pyramin can be mixed with triallate (Avadex BW), TCA, or Ro-Neet.

3. CROPS: Beets (table, sugar).

4. WEEDS CONTROLLED: Black nightshade, buckwheat (wild), chickweed, knotweed, lady's-thumb, lamb's-quarters, mustard (wild, wormseed), oakleaved goosefoot, pigweed (prostrate, redroot), purslane, ragweed, shepherd's-purse, smartweed, stinkweed, wild carrot, yellow rocket.

5. WEEDS SUPPRESSED: None.

6. WHEN USED: Pyramin may be used as a pre-plant incorporated, pre-emergent or post-emergent treatment. However, in Alberta, a pre-plant incorporated treatment is recommended. Post-emergent treatments should be applied before the weeds have 3 leaves.

7. HOW TO APPLY:

With: Ground equipment.
Rate: Light Soils – 3.338 L/ac **(8.25 L/ha)** Heavy Soils – 4.148 L/ac **(10.25 L/ha)**
Water Volume: 40-100 L/ac **(100-250 L/ha)** Pre-plant – Apply Pyramin in a 17.5 cm band.
Incorporation: Fall Ridging: Cover with a 15-20 cm high ridge of soil. In the spring, level the ridges and leave guide marks to enable planting the bands. Avoid levelling deeper than the chemical placement.
Pressure: 275-350 kPa
Ground Speed: 9 km/h
Nozzles: All standard low pressure nozzles delivering 40-100 L/ac **(100-250 L/ha)**
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening jugs of Pyramin concentrate.

8. SPRAYING TIPS: The fall ridging technique seems to be the best application method in Alberta.

9. HOW IT WORKS: The active ingredient in Pyramin is absorbed by the roots and is translocated to the leaves.

10. EXPECTED RESULTS:

Weeds: If adequate moisture is present, the weeds will fail to emerge. If the soil is dry for a long period of time, weeds which emerge and become well established will not be fully controlled, but small emerged weeds may die back, once adequate moisture is present.

Crops: No effect.

11. EFFECTS OF RAINFALL: Not applicable

12. MOVEMENT IN SOIL: Pyramin does not move readily in the soil and cannot be leached out.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Care should be taken to avoid drift onto sensitive plants such as rapeseed and mustard.
Grazing Restrictions: The tops of beets grown in Pyramin treated soil may be used for human consumption or fed to livestock.
Crop Use After Hail: None

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 3,030 mg/kg
- no short-term or long-term human health problems are associated with this product when used according to label
- non-toxic to bees

15. PRECAUTIONS AND FIRST AID:

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Give plenty of milk and water to drink. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Store in a cool, dry place. Do not store below 0°C.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE: Oliver Agricultural Supply.

Additional information available from:

BASF Canada Ltd.
10 Constellation Court
Rexdale, Ontario
M9W 1K1
Phone: (416) 675-3611

REGLONE (diquat)

1. FORMULATIONS: Water soluble solution, 200 g/L
   Available in 5 L containers.

2. REGISTERED MIXES: None

   Mixing with other pesticides: Not recommended

3. CROPS: Rapeseed, flax, peas, sunflowers (confection, oil), mustard, potatoes, beans (red, kidney, white), soybeans, adzuki beans, alfalfa, bird's-foot trefoil, red and white Dutch clover – used as a desiccant.

4. WEEDS CONTROLLED: Kills most weeds present at the time of application.

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: The stage of crop development when Reglone should be applied as a desiccant varies for each crop:
   Rapeseed – Apply by aircraft when 60-75% of the seeds have turned from green to brown.
   Mustard – Apply by aircraft when 75% of the seeds have turned.
   Flaxseed – Spray when crop has reached 75% ball turn. This is the normal swathing time. Apply by aircraft.
   Sunflowers (confection, oil) – Apply when the seeds reach maturity which is 20-50% moisture in the seed and hull. Apply by aircraft.
   Field or Dry Peas – Spray by means of an aircraft when the crop has reached maturity. Treatment will not mature peas.
   Potato Vines – Spray at least two weeks before harvest. Spraying can be done by air or by a ground sprayer.
   Alfalfa, Bird's-foot Trefoil, Red Clover and White Clover grown for Seed – Apply no more than seven days prior to harvest by means of aircraft.
   Beans (red, white, kidney), Soybeans, Adzuki Beans – Spray when 80-90% of natural leaf defoliation of the bean plants has occurred. Spraying can be done by air or by a ground sprayer. Treatment does not mature beans.

7. HOW TO APPLY:

   With: Aircraft or ground equipment. Reglone can be applied to some crops by field sprayers but the booms must be set high enough to ensure proper coverage of the foliage being sprayed. It is more common though to have the application made with an aircraft.

   Rate: Rapeseed, Mustard – In light stands of rapeseed maturing evenly and fields free from weeds, use 0.809 L/ac **(2.0 L/ha)** in 20 L/ac **(45 L/ha)** of clean water. Heavy stands on fields which contain weeds, use 1.113 L/ac **(2.75 L/ha)** in 20 L/ac **(45 L/ha)** of clean water. Add Agral 90 as a wetting and spreading agent at a rate of 1 L/1,000 L spray mixture. Do not try to straight combine Argentine varieties of rapeseed. They must be swathed three days after application, or severe shelling and pod drop could occur should windy weather be experienced. Polish varieties may be straight combined.

   Sunflowers (confection, oil) – Apply Reglone at 0.607 L/ac **(1.5 L/ha)** in 20 L (45 L/ha) of clean water. Add Agral 90 as a wetting and spreading agent at a rate of 1 L/1,000 L spray mixture.

   Flaxseed – In light stands, or fields free from weeds, which are maturing evenly, apply Reglone at 0.607 L/ac **(1.5 L/ha)** in 20 L/ac **(45 L/ha)** of clean water. In heavy or weedy stands, or fields with variation in growth, use 1.113 L/ac **(2.75 L/ha)** in 20 L/ac **(45 L/ha)** of clean water. Higher volumes will generally give better results. Use Agral 90 at 1 L/1,000 L spray mixture.

   Field Peas and Dry Peas – In clean fields, apply Reglone at a rate of 0.607 L/ac **(1.5 L/ha)** in at least 20 L/ac **(45 L/ha)** of clean water. If green weeds are present use 1.113 L/ac **(2.75 L/ha)** in 20 L/ac **(45 L/ha)** of clean water. Use Agral 90 as a wetting and spreading agent at a rate of 1 L/1,000 L of spray mixture.

   Alfalfa, Bird's-foot Trefoil, Red Clover and White Clover Grown for Seed – Use 0.809-1.315 L/ac **(2-3.25 L/ha)** in 90-180 L/ac **(225-550 L/ha)** of clean water. Use Agral 90 at a rate of 1 L/1,000 L of spray mixture.

   Beans (red kidney, white), Soybeans, Adzuki Beans – Apply 0.809 L/ac **(2 L/ha)** where the weed infestation is light to moderate. In moderate to heavy weed infestation, use 1.113 L/ac **(2.75 L/ha)**. Use at least 120 L/ac **(300 L/ha)** of clean water. This treatment will not mature beans. Use Agral 90 as a wetting and spreading agent at a rate of 1 L/1,000 L of spray mixture.

   Water Volume: Aircraft – minimum 8 L/ac **(20 L/ha)**
   Ground – 100-400 L/ac **(250-1,000 L/ha)**
   Incorporation: Not applicable
   Pressure: 275-400 kPa
   Ground Speed: 9 km/h
   Nozzles: All standard nozzles delivering the required volumes.

   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a face shield and apron when opening containers of Reglone liquid concentrate.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

8. SPRAYING TIPS:

(a) Reglone can be applied easily in high or low volume sprayers which have been properly calibrated to deliver the correct number of L of spray/ac or spray/ha.
(b) Reglone applications made on cloudy days, during dull sunlight or just prior to or during periods of darkness will generally increase the subsequent effectiveness of the treatment.
(c) Use clean (non-turbid) water for spraying Reglone, as muddy water will reduce effectiveness.
(d) It is important to thoroughly wash equipment after spraying – use a wetting agent (Agral 90 at 60 mL/100 L of water), flush and spray out, then thoroughly rinse with clean water. When possible, the equipment should be filled with clean water and left overnight. Spray out before storing equipment or using for other materials.

9. HOW IT WORKS: Reglone is absorbed by all leaf and stem surfaces, but it does not move in the plant. Once inside the plant Reglone interferes with the photosynthetic process of the plant. This is followed by yellowing and eventual death of the plant.

10. EXPECTED RESULTS:

Weeds: Reglone provides immediate, fast and virtually complete top kill of maturing annual weeds. Usually yellowing will start to occur within a few hours of application. Desiccation of the plant will continue rapidly and eventual death will occur.

Crops: Usually leaf kill will occur within a few days of application. Stem fall will take longer depending on the crop, but in general harvesting should commence within 7-14 days of application.

Conditions under which poor results may be expected:
1. Insufficient water and rate for adequate coverage of the crop.
2. Application prior to the recommended stage.
3. Spray application during periods when climatic conditions are not favorable, (i.e. windy, temperature inversion, etc.)

11. EFFECTS OF RAINFALL: Once the spray solution has dried on the plant tissue, rain will not reduce the effectiveness.

12. MOVEMENT IN SOIL: Reglone binds to the soil and becomes biologically unavailable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Avoid application or drift onto crops, ornamental plants, lawns, grazing areas or other desirable growth.
Grazing Restrictions: None
Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- has very high acute toxicity to mammals
  oral LD_{50} rats = 230 mg/kg
- **has the potential to cause cataracts, if the eyes are constantly exposed**
- may cause oral and nasal irritation shortly after use
- does not cause lung damage as does paraquat, a close relative

15. PRECAUTIONS AND FIRST AID: Use all safety measures to avoid getting Reglone in the eyes. Avoid breathing spray mist. Use of respirator recommended.

- If in eyes, wash for 15 minutes with clean water and get medical attention. Use of goggles recommended.
- If on skin, wash immediately with soap and water.
- If swallowed, induce vomiting. Give plenty of water. **Get medical attention fast. This is essential.**
- Take labelled container with you to the doctor.
- If delay unavoidable, induce further vomiting by giving plenty of water and sticking finger down the throat.
- Take the information on this herbicide in this booklet with you to doctor.

FOR PHYSICIAN: If swallowed give stomach wash-out and test urine and gastric aspirate for diquat. If positive, give up to 1 litre of adsorbent suspension (30% Fuller's Earth, activated charcoal or amberlite resin) mixed with a purgative ($MgSO_4$, Na_2SO_4 or mannitol). Repeat administration of adsorbent suspension every 2 hours for first 24 hours and every 4 hours for the next 24 hours, plus purgatives as required. Maintain and monitor electrolyte and fluid status daily. Consider haemodialysis or haemoperfusion, using charcoal column. Delay oxygen as long as possible. **If in eyes,** treat symptomatically, using antibiotics and steroids as necessary. Emergency telephone numbers 416/643-4123 8:00 a.m. – 4:45 p.m. After hours 416/528-6771 (state as calling for Chipman).

16. STORAGE: Reglone will crystallize if subjected to freezing temperatures. It, therefore, requires heated storage.

17. WHERE AVAILABLE: From major grain companies and many independent farm supply dealers.

Additional information available from:

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421 between 8:00 a.m. and 4:45 p.m.

RO-NEET (cycloate)

1. FORMULATIONS: Emulsifiable concentrate 720 g/L (Ro-Neet 7.2E).
Available in 4, 20 and 200 L containers.
Granules – 10% (Ro-Neet 10G).
Available in 20 kg bag.

2. REGISTERED MIXES: Ro-Neet 7.2E + liquid fertilizer

Mix restrictions: Compatibility test
Mixing with other pesticides: Not recommended

3. CROPS: Ro-Neet 7.2E – red beets, spinach, sugar beets.
Ro-Neet 10G – sugar beets.

4. WEEDS CONTROLLED:

Annual Grasses	**Annual Broad-leaf Weeds**
Barnyard grass	Black nightshade
Green foxtail	Henbit
Yellow foxtail	Hairy nightshade
Wild oats	Lamb's-quarters
	Purslane
	Redroot pigweed

5. WEEDS SUPPRESSED: None

6. WHEN USED: Ro-Neet is only applied in the spring before planting, soil incorporated.

7. HOW TO APPLY:

With: Ground equipment or equipment designed for application of granular herbicides.

Rate: Red Beets – use Ro-Neet 7.2E at 1.92 L/ac **(4.75 L/ha)** on light soils and 2.53 L/ac **(6.25 L/ha)** on heavier soils.
Spinach – use Ro-Neet 7.2E at 1.92 L/ac **(4.75 L/ha)** on sandy soils only.
Sugar Beets – use Ro-Neet 7.2E at 2.53-3.14 L/ac **(6.25-7.75 L/ha)** on mineral soils only. Use Ro-Neet 10G at 18.2-22.7 kg/ac **(45-56 kg/ha)** pre-plant incorporated on mineral soils only. Use higher rate on heavier soils and lower rate on light sandy soils.

Water Volume: 80-160 L/ac **(200-400 L/ha)** with Ro-Neet 7.2E.

Incorporation: Incorporation must be thorough for good weed control and should be carried out immediately (within minutes) after application. Only two types of implements can provide satisfactory incorporation – these are:

1. Hooded power-driven rotary tiller, which is set to uniformly mix to a 5-7.5 cm depth.
2. Tandem or one way discs set to 10-15 cm. On heavy and medium soils cross discing (at right angles to the first) is required for adequate incorporation. On light soils, disc once followed by harrowing for additional mixing and to level the seedbed.

For maximum weed control sow the crop immediately after incorporation.

Pressure: 150-350 kPa

Ground Speed: 9 km/h

Nozzles: All standard and low pressure nozzles
delivering approximately 80-160 L/ac **(200-400 L/ha)**.

Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of liquid concentrate.

8. SPRAYING TIPS: Use 80-160 L/ac **(200-400 L/ha)** high volume, low-pressure nozzles with Ro-Neet 7.2E to ensure maximum uniform coverage.

9. HOW IT WORKS: Ro-Neet is taken in by the roots and shoots of a germinating weed. It disrupts and stops further growth which kills the germinating weed. Ro-Neet is not persistent in the soil, however, it will provide effective weed control for approximately 6-8 weeks.

10. EXPECTED RESULTS:

Weeds: Ro-Neet controls a wide variety of weeds at the time when weed control is essential. Ro-Neet controls the weeds before they can compete for moisture and nutrients needed by the crop. Since Ro-Neet is absorbed by the weed shoot, most effected weeds will not emerge. Numerous chlorotic and bleached shoots may be visible by removing the top few inches of treated soil.

Crop: Applied according to directions and under normal growing conditions, Ro-Neet will not harm the treated crop. However, during germination and early stages of growth, unusually cold and wet or hot and dry weather, insect, nematode or plant disease attack, the use of certain soil-applied systemic insecticides, highly saline or alkaline soil conditions, improperly placed fertilizers or soil insecticides, may create abnormal conditions that weaken crop seedlings. Ro-Neet used under these conditions could result in crop injury.

Conditions under which poor results may be expected:
1. Conditions not suitable for application and incorporation (i.e. wet, cloddy soils).

11. EFFECTS OF RAINFALL: Ro-Neet is soluble in water and excessive moisture may leach Ro-Neet from the surface. This is not generally a problem.

12. MOVEMENT IN SOIL: Ro-Neet will move readily in the soil.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is low
Grazing Restrictions: Not applicable
Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- has very low acute toxicity to mammals
  oral LD_{50} rats = 3,160 mg/kg
- no short-term or long-term human health problems have been associated with this product
- very toxic to fish; non-toxic to birds

15. PRECAUTIONS AND FIRST AID: Avoid breathing fumes or spray mist.
Do not get on skin or in eyes.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes.
- If swallowed, **do not induce vomiting**. Get medical attention.
- Take labelled container to doctor.
- Take the information on this herbicide with you to the doctor.

FOR PHYSICIAN:
1. **Do not** induce vomiting or lavage stomach. Aspiration pneumonia from solvent (kerosene) may complicate or overshadow poisoning.
2. Give symptomatic and supportive treatment. Consult you local Poison Control Center for additional information.

16. STORAGE: Ro-Neet 7.2E must be protected from temperatures below -6°C. At temperatures below this, the product will crystallize. Do not store Ro-Neet near any seed or fertilizers.

17. WHERE AVAILABLE: From major grain companies and many independent farm supply dealers.

Additional information available from:

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421

ROUNDUP (glyphosate)

1. FORMULATIONS: Water soluble solution 356 g/L as isopropylamine salt.
   Available in 1, 4 or 10 L containers.

2. REGISTERED MIXES: Roundup + Torch
   Roundup + Torch + non-ionic surfactant
   Roundup + non-ionic surfactant
   Use mixes with Torch in No-Till situations.

   Mixing restrictions: Clean water free of suspended clay, silt or organic matter must be used.
   Mixing with other pesticides: Not recommended

3. CROPS: This is a non-selective herbicide used for pre-plant, pre-emergence or for spot application in certain crops as indicated on the product label.

4. WEEDS CONTROLLED: As labelled

Perennials
Bindweed (field)
Bluegrass (Canada and Kentucky)
Bromegrass (smooth)
Canada thistle
Cattail (common)
Curled dock
Hoary cress
Indian hemp
Milkweed (common)
Poison-ivy
Quackgrass
Sow-thistle (perennial)
Toadflax
Wormwood

Annuals
Bluegrass (annual)
Buckwheat (wild)
Downy brome
Green foxtail
Japanese knotweed
Kochia
Lamb's-quarters
Mustard (common)
Prickly lettuce
Ragweed (common)
Russian thistle
Shepherd's-purse
Smartweeds (annual)
Sow-thistle (annual)
Wild oats
Wild vetch

Deciduous brush species
Birch – Betula spp.
Cherry – Prunus spp.
Maple – Prunus spp.
Poplar – Populus spp.
Raspberry – Rubus spp.
Snowberry – Symphoricarpos occidentalis
Willow – Salix spp.

5. WEEDS SUPPRESSED: Many

6. WHEN USED: Canada thistle and quackgrass must be a minimum of 20-25 cm in height and up to the early heading stage or early bud stage of growth. All other perennials must have reached the early head or early bud stage of growth at treatment time. Annual weeds are controlled with the lower labelled rate when 15 cm or less in height. Apply to deciduous brush when actively growing from June through August.

   The registered mixes with Roundup are recommended for use in chemical-fallow or zero-till situations, to control annual weeds.

7. HOW TO APPLY:

With: Ground equipment only
Rate: Perennial weeds:
- Bindweed (field) – 2.8-4.86 L/ac **(7-12 L/ha)**
- Canada thistle – 1.9-2.8 L/ac **(4.75-7 L/ha)**
- Milkweed (common) – 4.86 L/ac **(12 L/ha)**
- Quackgrass – 1.9-2.8 L/ac **(4.75-7 L/ha)**
- Other perennials – 2.8-4.86 L/ac **(7-12 L/ha)**

Annual weeds – 0.91-1.42 L/ac **(2.25-3.5 L/ha)**
Brush species – 4.05 L/ac **(10 L/ha)**
Minimum or zero tillage systems 0.445-0.567 L/ac **(1.1-1.4 L/ha)**
Water Volume: Handgun and high volume equipment – use coarse sprays only at 80-120 L/ac **(200-300 L/ha)** Boom equipment – 40-120 (100-300 L/ha)
Incorporation: Not applicable
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: All fan type nozzles except floodjet delivering 40-120 L/ac **(100-300 L/ha)**

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Reduced Rate: The registration applies only to fall application for quackgrass control. With post-harvest applications, regrowth is required for best results. Regrowth should have 3-4 leaves from the base of old plants and should be actively growing. Only light to moderate infestations should be treated with the reduced rate (eg. up to 150 shoots per square meter). Cereal straw will produce a canopy over quackgrass shoots but delaying the treatment will permit the shoots to penetrate this layer of straw. Application 4 to 6 weeks after swathing is recommended in most instances. Frost of –5°C will be tolerated by new shoots. Frost damage to growing shoots could reduce control and the field should be left untilled for spring treatment. Frost damage is exhibited by the drying of new shoots shortly after the frost. Allow 5 or more days after application for tillage. Recommended rate of application is 1.01 L/ac **(2.5 L/ha)**. This treatment provides season long control of quackgrass. A maximum water volume rate of 45 L/ac **(110 L/ha)** should be used.

Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS: Apply in sunny, warm conditions.

9. HOW IT WORKS: Roundup is a systemic herbicide which moves through the plant from the point of foliage contact to and into the root system.

10. EXPECTED RESULTS: Visible effects on most annual weeds occur within 2 to 4 days but on most perennial weeds may not occur for 7 to 10 days. Visible effects are a gradual wilting and yellowing of the plant which advances to complete browning of above ground growth and deterioration of underground plant parts. Extremely cool or cloudy weather at treatment time may slow down activity of this product and delay visual effects.

Conditions under which poor results may be expected:
- Rainfall within 6 hours after application.
- Inadequate spray coverage of target species.
- Too early application on perennials species.
- Using an unsatisfactory water supply which contains suspended silt, clay and organic matter.
- Extreme plant stress due to drought and high temperatures at treatment time.
- Disturbance of a perennial's root system due to cultivation prior to treatment.

11. EFFECTS OF RAINFALL: Rainfall occurring within 6 hours after application may reduce effectiveness. Heavy rainfall within 2 hours after application may wash the chemical off the foliage and a repeat treatment may be required.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Do not allow spray mist to drift since even minute quantities of spray can cause severe damage or destruction of nearby crops, plants or other areas on which treatment is not intended. Do not apply when winds are gusty or in excess of 8 km/h or when other conditions, including lesser wind velocities, will allow drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in fine particles (mist) which are more likely to drift.
Grazing Restrictions: Do not graze or harvest treated areas in forages until treated plants have turned brown and started to deteriorate.
Crop Use After Hail: Do not graze or harvest treated areas in forages until treated plants have turned brown and started to deteriorate.
Succeeding Crops: No restrictions

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 4,320 mg/kg
- not a skin irritant
- no long-term or short-term human health problems have been associated with this product when used according to label
- non-toxic to birds, fish and bees

15. PRECAUTIONS AND FIRST AID: Avoid contact with skin and eyes and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container to doctor.

This product may react with galvanized steel or unlined steel containers of spray tanks to produce hydrogen gas which may explode or burn causing serious personal injury.

Spray solution should be mixed, stored and applied only in stainless steel, aluminium, fiberglass, plastic and plastic-lined steel containers.

16. STORAGE: Freezing will not affect the performance of Roundup.

17. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Ltd., Green Cross Product Dealers, United Grain Growers, Pfizer Chemical Dealers, Federated Co-operatives, Pioneer Grain.

Additional information available from:

Monsanto Canada Inc.
55 Murray Park Road
Winnipeg, Manitoba
R3J 3W2
Phone (204) 885-6740

In case of emergency involving a Monsanto herbicide call the following number collect at any time, phone 1-(314) 694-1000.

SABRE (bromoxynil + MCPA)

1. FORMULATIONS: Emulsifiable concentrate,
720 g/L (360 g/L bromoxynil + 360 g/L MCPA)
Available in 12.5 L containers.

2. REGISTERED MIXES: Sabre + MCPA Ester
Sabre + Avenge

Mixing with other pesticides: Fill the sprayer tank half full with clean water, than add the required amount of Sabre and mix thoroughly. Fill tank with water, add Avenge and mix again before spraying.

3. CROPS: Wheat, barley, oats, fall rye, flax and canary seed.

Underseeding: Not recommended.

4. WEEDS CONTROLLED: Bluebur, buckwheat (common, Tartary and wild), common groundsel, cow cockle, flixweed, knawel, kochia, lamb's-quarters, mustards, (ball, tumble, wild and wormseed), redroot pigweed, Russian thistle, scentless chamomile, shepherd's-purse, smartweeds (annual), stinkweed, volunteer rapeseed (canola), volunteer sunflower, and hemp-nettle*.

* MCPA + Sabre tank-mix

5. WEEDS SUPPRESSED: Canada thistle, perennial sow-thistle.

6. WHEN USED:

- Spray before weeds are past the 3-5 leaf stage.
- Wheat, Barley and Oats: 2-leaf to early flag-leaf.
- Fall rye, winter wheat: from the time the crop commences growth in the spring to the early flag leaf stage.
- Flax: 5-10 cm high.
- Canary Seed: 3-5 leaf stage.

7. HOW TO APPLY:

With:	Aircraft or ground equipment.
Rate:	315.7 mL/ac **(780 mL/ha)** [one 12.5 L container treats 39.5 ac (16 ha)]
Water Volume:	– aircraft – 8 or more L/ac **(20 or more L/ha)**, 16-20 L/ac **(40-50 L/ha)** preferred – ground – 20 L/ac **(50 L/ha)** or more.
Incorporation:	Not applicable
Ground Speed:	9 km/h
Nozzles:	Flood jet nozzles are not recommended.
Protective Equipment:	Standard protective clothing used when applying herbicides.

8. SPRAYING TIPS:

(a) Avoid spraying during severe drought. Under conditions of high temperature and humidity, slight discolouration of cereals may occur. However, this has not resulted in permanent injury and has not reduced crop yields.
(b) Flax is less tolerant to Sabre than cereals, therefore avoid spraying flax under hot, humid weather and daytime temperatures over 29°C.
(c) Adequate spray coverage is important.

9. HOW IT WORKS: Bromoxynil is absorbed by the foliage but not translocated once absorbed. It inhibits plant photosynthesis and respiration. MCPA is absorbed through leaves and readily translocated in the plant. It has systemic action.

10. EXPECTED RESULTS:

Broad-leaf Weeds: Affected plants will turn brown within 3-5 days of application.

Flax: Flax is less tolerant of this product that are cereal crops. Some leaf-burn and retarded growth may delay maturity 2 to 3 days.

Conditions under which poor results may be expected:
1. Late spraying: majority of the weeds past the 5-6 leaf stage.
2. Inadequate spray coverage.
3. Too low a spray pressure.

11. EFFECTS OF RAINFALL: Rainfall within 1 hour may decrease effectiveness.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Avoid spray drift.
Grazing Restrictions: No restrictions.
Crop Use After Hail: No restrictions.

14. TOXICITY:

Fish and Wildlife: Toxic to fish, so do not contaminate water.
Rat LD_{50} 345 mg/kg.

15. PRECAUTIONS AND FIRST AID: Harmful if swallowed. Avoid contact of the chemical with skin and eyes and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, **do not induce vomiting,** unless a large amount swallowed. Rush person to nearest hospital.
- Take labelled container with you to doctor.

16. STORAGE: Heated storage not required.

17. WHERE AVAILABLE: United Grain Growers, United Farmers of Alberta, Alberta Wheat Pool, Cargill Grain, Federated Co-operatives and Oliver Dealers.

Additional information available from:

Allied Chemical Services Ltd.
5507 – 1 Street S.E.
Calgary, Alberta
T2H 1H9
Phone: (403) 253-8471

SENCOR (metribuzin)

1. FORMULATIONS: 500 Flowable 500 g/L
   Available in 5 L jugs, 4 jugs/case

   750 water dispersable granule (sprayule)
   750 g active/kg
   Available in 3 kg bags, 4 jugs/case

2. REGISTERED MIXES: Sencor + Banvel – Cereals (except Klondike Barley)
   Sencor + 2,4-D amine – Cereals (except Klondike Barley)
   Sencor + Eptam – Potatoes
   Sencor + MCPA amine – Cereals
   Sencor + Target – Cereals
   Sencor + Treflan – Fababeans

3. CROPS: Spring wheat, barley, potatoes, lentils, fababeans, peas and alfalfa.

   Underseeding: Do not underseed.

4. WEEDS CONTROLLED:

   (a) Post-emergence application, 2-5 leaf stage of crop 172-222.5 mL/ac **(425-550 mL/ha)**. Ball mustard, chickweed, common groundsel, corn spurry, hemp-nettle*, henbit, lady's-thumb, lamb's-quarters, night-flowering catchfly, redroot pigweed*, Russian thistle, green smartweed, stinkweed, Tartary buckwheat, volunteer rapeseed, wild mustard, wormseed mustard.
   (b) Post-emergence application, 4-5 leaf stage of crop, 111 mL/ac **(275 mL/ha)**. Chickweed, lady's-thumb, lamb's-quarters, redroot pigweed, green smartweed, stinkweed, volunteer rapeseed, wild mustard, hemp-nettle (suppression).
   (c) Dormant application (late fall on alfalfa) 0.91 L/ac **(2.25 L/ha)**. Treat only dormant established crops of alfalfa, after growth ceases in the fall.

   * 222.5 mL/ac **(550 mL/ha)** rate required for weeds

5. WEEDS SUPPRESSED: Canada thistle and sow-thistle with the 2,4-D, MCPA and Banvel mixes.

6. WHEN USED:

   Wheat and Barley – Sencor alone – 2-5 leaf stage
   Sencor + Banvel – 2-3 leaf stage of barley, (except Klondike)
   2-4 leaf stage of wheat
   Sencor + 2,4-D amine – 3-5 leaf stage (except Klondike barley)
   Sencor + MCPA amine – 3-5 leaf stage
   Sencor + Target – Barley – 2-3 leaf stage
   Wheat – 2-5 leaf stage
   Potatoes – Sencor alone – apply before weeds are 4 cm high
   Sencor + Eptam – apply pre-plant incorporated
   Fababeans – Sencor + Treflan – apply pre-plant incorporated
   Lentils – Sencor alone – apply before lentil vines are 15 cm long, after weeds have emerged but while they are small, less than 5 cm.
   Peas – Sencor alone – Apply before pea vines are 15 cm long and after weeds have emerged but while they are small, less than 5 cm.
   Alfalfa (Grown under irrigation) – Sencor – Apply to dormant established stands of alfalfa after growth ceases in the fall. Injury may occur to alfalfa if Sencor is applied earlier than 18 months after seeding.

7. HOW TO APPLY:

   CAUTION: Lentils and peas provide little competition against weed growth due to their low growth habit. Under conditions of heavy weed pressure or lush weed growth adequate control may not be provided due to weed regrowth.
   Apply specified dosage in not less than 70 L/ac **(170 L/ha)** of water.
   Do not tank mix with any other pesticides, wetting agents or surfactants.
   Do not apply within 3 days after periods of cool, wet or cloudy weather or to lentils past the recommended growth stage, else crop injury may occur.
   Do not apply more than once per season.
   Crop must be planted at least 5 cm below the soil surface.

   With: Ground equipment (preferably)
   Rate: Barley – 0.111-0.223 L/ac **(0.275-0.55 L/ha)** of 500 Flowable alone or tank-mixed with 0.344-0.445 L/ac **(0.85-1.1 L/ha)** of MCPA or 2,4-D amine 500 or tank-mixed at 0.111-0.172 L/ac **(0.275-0.425 L/ha)** of Sencor with 0.111 L/ac **(0.275 L/ha)** of Banvel 400 or tank mixed at 0.405-0.607 L/ac **(1.0-1.5 L/ha)** of Target. Do not use any tank mix of Sencor with either Banvel or 2,4-D on Klondike barley.

Wheat – 0.111-0.172 L/ac **(0.275-0.425 L/ha)** of 500 Flowable alone or tank-mixed with 0.344-0.445 L/ac **(0.85-1.1 L/ha)** of MCPA or 2,4-D amine 500 or tank-mixed with 0.111 L/ac **(0.275 L/ha)** of Banvel 400 or tank mixed with 0.405-0.607 L/ac **(1.0-1.5 L/ha)** of Target.

Lentils – 0.172 L/ac **(0.425 L/ha)** of 500 Flowable applied as a post-emergence broadcast spray in at least 70 L/ac **(170 L/ha)** of water.

Peas – 0.172-0.223 L/ac **(0.425-0.55 L/ha)** of 500 Flowable applied as a post-emergence broadcast spray in at least 70 L/ac **(170 L/ha)** of water.

Potatoes
- 0.223 L/ac **(0.55 L/ha)** of 500 Flowable applied early post-emergence.
- under irrigation, 0.223-0.911 L/ac **(0.55-2.25 L/ha)** (maximum) applied early post-emergence.
- irrigation or dryland, 0.223-0.344 L/ac **(0.55-0.85 L/ha)** (maximum) of 500 Flowable tank-mixed with 1.72-2.225 L/ac **(4.25-5.5 L/ha)** of Eptam 800 as a pre-plant incorporated treatment.

Fababeans
Spring Application – 0.223-0.344 L/ac **(0.55-0.85 L/ha)** of 500 Flowable tank-mixed with 0.61-0.81 L/ac **(1.5-2.0 L/ha)** of Treflan 545 EC as a pre-plant incorporated treatment.
Fall Application – 0.344 L/ac **(0.85 L/ha)** of 500 Flowable tank-mixed with 0.81-1.05 L/ac **(2.0-2.6 L/ha)** of Treflan 545 EC as a pre-plant incorporated treatment.
Alfalfa (Under irrigation only) – 0.911 L/ac **(2.25 L/ha)** of 500 Flowable as a dormant application after growth ceases in the fall.

Water Volume: 40 L/ac **(100 L/ha)** – except 70 L/ac **(170 L/ha)** for lentils and peas.
Incorporation: For Sencor + Eptam on potatoes refer to Eptam section. For Sencor + Treflan on fababeans refer to Treflan section.
Pressure: 200-275 kPa
Ground Speed: 9 km/h
Nozzles: All standard or low pressure nozzles delivering 40 L/ac **(100 L/ha)**.
Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening jugs of the concentrated liquid.
- plus a respirator and goggles when opening bags of Sencor granules.

8. SPRAYING TIPS:

(a) Allow a 4-5 day interval between the application of Sencor and post-emergent wild oat herbicides.
(b) Weed control may be reduced if Sencor is applied later than the 5 leaf stage of crop.
(c) If frost occurs, allow 4-5 days for crop to recover before applying Sencor.
(d) Crop may be sprayed when it is wet with dew.
(e) Lentils and Peas – do not apply more than once per crop season. Crop must be planted at least 5 cm below the soil surface. To improve coverage the spray boom may be rotated forward by 45°.

9. HOW IT WORKS: Sencor is a systemic herbicide which enters the plant through the leaf and to some extent through the roots. It is translocated upward and gathers in the leaves, especially the new growth. The site of action is the chloroplast where it acts to block photosynthesis. The eventual result is that the weed turns brown and dies.

10. EXPECTED RESULTS:

Broad-leaf Weeds: The weeds show yellowing at about 5-7 days after application. The yellowing will turn to browning and the weeds will eventually die. All weeds should be dead within 14-16 days after application. Shallow-rooted broad-leaf weeds, like chickweed and corn spurry may germinate after spraying and thus be missed by spray. However, the spray that misses the foliage of weeds and crops is washed into the soil where it is active for a relatively short period of time. The new germinating chickweed will be killed through root uptake of Sencor.

Crop: Under certain environmental conditions, such as extremely hot weather or frost that occurs within 1-2 days of application, the crop will show some yellowing and slight reduction in height. The discolouration will not be visible within 7-10 days. In the case of lentils when 0.172 L/ac **(0.425 L/ha)** are applied – suppression only of the following weeds will be achieved: chickweed, corn spurry, hemp-nettle, lamb's-quarters, stinkweed, volunteer rapeseed, wild mustard, ball mustard, green smartweed, Tartary buckwheat.

11. EFFECTS OF RAINFALL: Rainfall within 6 hours after application may reduce weed control.

12. MOVEMENT IN SOIL: Sencor is quite soluble in water and therefore is quite mobile, however, it is bound by organic matter and clay. Net lateral movement is limited.

13. GRAZING AND CROPPING RESTRICTIONS:

- Do not graze or feed treated crop to livestock within 30 days of application (lentils and peas – 70 days)
- Do not harvest for grain within 60 days of application (lentils and peas – 70 days)

14. TOXICITY:

- has low acute mammalian toxicity
  oral LD_{50} rat = 1,100 mg/kg
- no short-term or long-term human health problems are associated with this product when used according to label
- slightly toxic to fish and birds

15. PRECAUTIONS AND FIRST AID: Avoid contact of the chemical with skin and eyes and do not inhale spray mist.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If Sencor liquid is swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container with you to doctor.

FOR PHYSICIAN: The exact toxic mode of action of Sencor is not known. In experimental animals acutely poisoned with Sencor, no characteristic symptoms were noted other than sedation. The patient should be treated symptomatically.

16. STORAGE: Neither formulation of Sencor is damaged by freezing.
Store in a cool dry place and avoid large temperature fluctuations over the period of storage.

17. WHERE AVAILABLE: Alberta Wheat Pool, United Grain Growers, Pioneer Grain, Green Cross Product Dealers, Oliver Agricultural Supply, Pfizer Chemical Dealers.

Additional information available from:

Chemagro Ltd.
1355 Aerowood Drive
Mississauga, Ontario
L4W 1C2
Phone: (416) 625-5280

Chemagro Ltd.
#203, 610 – 70 Avenue S.E.
Calgary, Alberta
T2H 2J6
Phone: (403) 259-2863

SIMMAPRIM (simazine)

1. FORMULATIONS: 80% wettable powder
   Available in 25 kg drums

2. REGISTERED MIXES: Simmaprim + amitrol
   Simmaprim + atrazine
   Simmaprim + atrazine + diuron
   Simmaprim + paraquat
   Simmaprim + sodium chlorate, sodium metaborate octahydrate, sodium metaborate tetrahydrate

3. CROPS: Total weed control and bare ground maintenance on non-crop land.

4. WEEDS CONTROLLED: Most annual and perennial broad-leaf weeds and grasses that are found on non-cropped land. Horsetail, milkweed and sedges may require more than one treatment.

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Depends on soil moisture and type of weeds. Apply before or during weed emergence using available rainfall. Can be applied in fall for control of perennial weeds.

7. HOW TO APPLY:

With:	Equipment that will apply up to 890 L/ac **(2,200 L/ha)**
Rate:	5.75-11.5 kg/ac **(14.2-28.4 kg/ha)**
Water Volume:	90-890 L/ac **(225-2,200 L/ha)**
Incorporation:	Not applicable
Pressure:	210-315 kPa
Ground Speed:	Sufficient for good coverage
Protective Equipment:	Standard protective clothing used when applying herbicides. - plus a respirator and goggles when opening drums of Simmaprim.

8. SPRAYING TIPS: Provide gentle agitation during mixing and spraying and especially after any break in spray operations to ensure that the material is in suspension. Do not use nozzle screens finer than 50 mesh.

9. HOW IT WORKS: Through the roots only. Rainfall assists in moving the chemical to the root zone. Simazine is a triazine herbicide. Triazines are potent inhibitors of the Hill Reaction (photosynthetic inhibitors). Triazines also affect uptake of nutrients and changes in nitrogen metabolism seem to occur.

10. EXPECTED RESULTS: Failure of weeds to emerge or, depending on weather conditions, weeds may die back after emergence.

11. EFFECTS OF RAINFALL: Average to moderate rainfall can enhance performance. Very heavy rainfall on sandy soils might cause leaching and thus a decrease in efficacy.

12. MOVEMENT IN SOIL: Movement of Simmaprim 80W in the soil is negligible; damage to nearby shrubs and trees is unlikely.

13. GRAZING AND CROPPING RESTRICTIONS: Not applicable – for use on non-crop land. After the effect of Simmaprim has worn off, treated land may be planted with trees, ornamentals, or other plants.

14. TOXICITY:

    - has very low acute mammalian toxicity
      oral LD_{50} rats = 5,000 mg/kg
      dermal LD_{50} rabbits = 10,200 mg/kg
    - may cause skin and eye irritation
    - **may cause skin disease (dermatitis)**
    - no short-term or long-term human health problems have been associated with this product when used according to label
    - has been in use for over 18 years
    - not a skin sensitizer

15. PRECAUTIONS AND FIRST AID: Prevent skin and eye exposure to this product. Do not inhale dust. Use all safety measures possible.

    - If on skin, wash off immediately.
    - If in eyes, wash with clean water for 15 minutes and get medical attention. Do not delay.
    - Take this information on the herbicide with you to your doctor.

    FOR PHYSICIAN: If Simazine is ingested accidentally there is no specific antidote. Induce emesis or lavage stomach. Give a saline laxative and supportive therapy.

16. STORAGE: Store in dry area. Heating not required.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE: Midland Vegetation Control Inc.

Additional information available from:

Ciba-Geigy Canada Ltd.
6860 Century Avenue
Mississauga, Ontario
L5N 2W5
Phone: (416) 836-9445

SINBAR (terbacil)

1. FORMULATIONS: 80% wettable powder
   Available in 2 kg bags

2. REGISTERED MIXES: None

3. CROPS: Alfalfa – after crop has been established for 1 growing season
   – registered for use in forage and seed alfalfa

   Nurse crop: Not recommended

4. WEEDS CONTROLLED: Annual bluegrass, downy brome, green foxtail, mustard, perennial ryegrass, prickly lettuce, shepherd's-purse, stinkweed and sow-thistle (annual).

5. WEEDS SUPPRESSED: Dandelion (less than 2 years old), quackgrass
   Weeds not controlled – Canada thistle (perennial)
   – Field bindweed
   – Perennial sow-thistle

6. WHEN USED: Apply after alfalfa goes dormant in the fall or before new growth begins in the spring. A fall application is preferred.

7. HOW TO APPLY:

   With: Ground equipment
   Rate: 0.283-0.607 kg/ac **(0.7-1.5 kg/ha)**. Use the lower rate on lighter soils and the higher rate on heavier soils. Do not use on soils containing less than 1% organic matter as injury may result. [One 2 kg bag treats 6.9 ac (2.8 ha) at the 0.283 kg/ac **(0.7 kg/ha)** rate.]
   Water Volume: 80 L/ac **(200 L/ha)**
   Incorporation: None required. However, moisture in the form of rainfall or irrigation is required to activate the chemical.
   Pressure: 275 kPa
   Ground Speed: 9 km/h
   Nozzles: All standard nozzles delivering approximately 80 L/ac **(200 L/ha)**. Stainless steel nozzles are preferred.
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a respirator and goggles when opening bags of Sinbar.

8. SPRAYING TIPS:

   (a) Use 50 mesh line strainers and screens.
   (b) Continuous agitation is required.
   (c) Do not plant areas to any crop within 2 years after last treatment.

9. HOW IT WORKS: Sinbar must be moved into the root zone of the weed with moisture. Sinbar is absorbed by the root system of the plant. Once in the plant, its mode of action is to strongly inhibit photosynthesis.

10. EXPECTED RESULTS:

    Weeds: Once Sinbar is in the soil it kills weeds as they germinate. Emerged weeds will start to yellow and die. Total effect is dependent on the soil type, amount of moisture, and species to be controlled.

    Crop: No effect should be seen if applied when alfalfa is dormant.

    Conditions under which poor results may be expected:
    1. Too little moisture for activation.
    2. Uneven coverage.
    3. Rate too low for soil type.

11. EFFECTS OF RAINFALL: Rainfall after application is desirable.

12. MOVEMENT IN SOIL: Under certain soil and moisture conditions some movement within the soil may be expected.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Most crops are sensitive to Sinbar.
    Grazing Restrictions: None
    Succeeding Crops: Do not plant treated area to any crop within 2 years of last treatment.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 5,000 mg/kg
- no short-term or long-term human health problems have been associated with this product when used according to label
- non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Use safety measures to protect the skin and eyes, and do not inhale dust.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.

16. STORAGE: Store in a cool dry place.

17. WHERE AVAILABLE: Alberta Wheat Pool, Niagara Chemical Dealers, Oliver Agricultural Supply, United Grain Growers, Pfizer Chemical Dealers, Federated Co-operatives.

Additional information available from:

DuPont Canada Inc.
#105, 333 - 25 Street E.
Saskatoon, Saskatchewan
S7K OL4
Phone: (306) 244-4511

SODIUM TCA SOLUTION/NaTA (TCA)

1. FORMULATIONS: NaTA granular formulation containing 85% TCA acid equivalent as sodium salt. Sodium TCA Solution formulation containing 645 g/L acid equivalent present as sodium salt.
   Available in 25 kg bags and 20 L pails.

2. REGISTERED MIXES: NaTA + MCPA amine or MCPA Sodium Salt
   NaTA + 2,4-D amine
   Sodium TCA Solution + MCPA ester
   Sodium TCA Solution + Buctril M (barley)

   If 2,4-D or MCPA is used add TCA to tank first.

3. CROPS: Barley, oats, rapeseed, flax, field peas, red beets, sugar beets, cabbage, cauliflower, tomatoes.

4. WEEDS CONTROLLED: Green and yellow foxtail, barnyard grass.

5. WEEDS SUPPRESSED: Quackgrass

6. WHEN USED:

   Oats and Barley – Apply when weeds are in the 1-3 leaf stage and the crop is in the 2-4 leaf stage. Oats and barley should be seeded 5 cm deep or deeper to reduce chances of crop injury.

   Barley Only – Sodium TCA + Buctril M.

   Field Peas – Apply when crop is 10-20 cm tall and foxtail is in the 1-3 leaf stage.

   Rapeseed and Flax – Apply when rapeseed is in the 2-4 leaf stage; flax should be 10-15 cm in height. Should be applied before weeds have 4 true leaves.

   Sugar Beets – Pre-emergence or post-emergence before sugar beets have 4 leaves.

   Red Beets – Apply before beets emerge.

   Cabbage and Cauliflower – Apply pre-emergence or directed post-emergence.

   Tomatoes – Apply 2 days before direct seeded crop emerges.

7. HOW TO APPLY:

   With: Ground equipment

   Rate: (use the lower rate on light sandy soil)
   Oats – for green foxtail, apply at 0.51-1.13 kg/ac **(1.25-2.75 kg/ha)** (granular), 0.81-1.52 L/ac **(2-3.75 L/ha)** (solution)
   Barley – for green foxtail, apply at 0.51 kg/ac **(1.25 kg/ha)** (granular), 0.81 L/ac **(2 L/ha)** (solution)
   Field Peas – for annual grass control, apply at 1.82 kg/ac **(4.5 kg/ha)** (granular), 2.23-3.64 L/ac **(5.5-9.0 L/ha)** (solution)
   Flax and Rapeseed – annual grass control, apply at 1.82 kg/ac **(4.5 kg/ha)** (granular), 2.23-3.64 L/ac **(5.5-9.0 L/ha)** (solution)
   Sugar Beets – annual grass control and reduction of quackgrass, apply at 1.82 kg/ac **(4.5 kg/ha)** (granular), 2.23-4.45 L/ac **(5.5-11 L/ha)** (solution) for post-emergence. Apply at 2.53-4.05 kg/ac **(6.25-10 kg/ha)** (granular), 4.45-6.07 L/ac **(11-15 L/ha)** (solution) for pre-emergence.
   Red Beets – apply 2.53-4.05 kg/ac **(6.25-10 kg/ha)** (granular), 3.64-6.88 L/ac **(9-17 L/ha)** (solution).
   Cabbage and Cauliflower – for annual grass control, apply at 2.185-3.4 kg/ac **(5.4-8.4 kg/ha)** (granular), 2.23-6.07 L/ac **(5.5-15 L/ha)** (solution)
   Tomatoes – for annual grass seedlings, apply at 1.416-2.23 kg/ac **(3.5-5.5 kg/ha)** (granular), 2.23-3.64 L/ac **(5.5-9 L/ha)** (solution)
   Non-selective Treatment – apply NaTA (TCA) for the control of established stands of quackgrass at 44.5 kg/ac **(110 kg/ha)**. For control of patches apply NaTA in the fall at 100-125 g/10 sq. m. on undisturbed soil and 75-90 g/10 sq. m. when combined with a thorough cultivaton such as that given by a plow or one-way disc. Use 40.5-81.0 L/ac **(100-200 L/ha)** of Sodium TCA Solution for undisturbed quackgrass. Use 20.25-40.5 L/ac **(50-100 L/ha)** when cultivation precedes treatment. Follow-up with cultivation or additional TCA solution as necessary.
   Suppression of Grasses – 5.26-6.88 L/ac **(13.5-17 kg/ha)** (granular) will cause established grasses to be stunted and prevent seed production. Apply 4.45-10.12 L/ac **(11-25 L/ha)** (solution) shortly before heading. This has been effective on bluegrass and quackgrass.

   At 0.51 kg/ac **(1.25 kg/ha)** rate, one 25 kg bag will treat 49 ac (20 ha), at 0.81 L/ac **(2 L/ha)** rate, one 20 L container will treat 24.7 ac (10 ha).

Water Volume: Barley and Oats: 32-40 L/ac **(80-100 L/ha)** (granular), 40 L/ac **(100 L/ha)** (solution).
Rapeseed and Flax: 40-60 L/ac **(100-150 L/ha)** (granular and solution).
Field Peas: 40 L/ac **(100 L/ha)** (granular and solution).
Other Crops: 40 L/ac **(100 L/ha)** (granular and solution).
Incorporation: Only applicable in spot treatment for quackgrass.
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: No screens smaller than 50 mesh flat fan type nozzles.
Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a respirator and goggles when opening bags of TCA.
- plus a face shield and apron when opening containers of liquid concentrate.

8. SPRAYING TIPS:

(a) Flush sprayer thoroughly after each use.
(b) Adequate agitation needed during mixing to completely dissolve TCA. Pre-dissolve TCA in a small amount of warm water to ensure quick and complete mixing.
(c) Use 50 mesh screens and filters. Stainless steel and hardened stainless steel nozzle types are recommended.
(d) Remove all nozzles and screens after use and wash in water.

9. HOW IT WORKS: TCA is absorbed more through the roots than by the foliage. It precipitates proteins within the plant, which are essential for growth.

10. EXPECTED RESULTS: Lightening of green coloration is the first noticeable effect of TCA on green foxtail. Browning of the leaf tips, growth retardation and eventual death of the grass follows.

Effects on the crops are similar to those present on the green foxtail if higher rates are used. In addition, on crops such as barley, increased tillering can result.

Conditions under which poor results may be expected:
1. Dry soil conditions.

11. EFFECTS OF RAINFALL: A light rainfall on newly treated soil is beneficial.

12. MOVEMENT IN SOIL: TCA acts mainly through the soil so activity will be greatest on sandy soil and under good moisture conditions.

13. GRAZING AND CROPPING RESTRICTIONS: Do not graze treated areas for at least 24 hours after treatment.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 5,000 mg/kg
- may cause skin and eyes irritation
- may cause burning if on skin for long time
- no short-term or long-term human health problems have been associated with this product when used according to label

15. PRECAUTIONS AND FIRST AID: Avoid skin and eye contact, do not inhale spray mist or dust particles.

- If on skin, wash off **immediately** with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, give a neutralizer such as lime water or amphogel by mouth. Keep patient warm and get medical attention immediately.
- Take labelled container to doctor.

16. STORAGE: Keep in dry storage. Frost does not affect NaTA.

17. WHERE AVAILABLE: Federated Co-operatives, Niagara Chemical Dealers, Pfizer Chemical Dealers, Alberta Wheat Pool, Oliver Agricultural Supply, Pioneer Grain and United Grain Growers.

Additional information available from:

Hoechst Canada Inc.
295 Henderson Drive
Regina, Saskatchewan
S4N 6C2
Phone: (306) 942-1500

Pfizer
Agricultural Chemicals Div.
2140 Notre Dame Avenue
Winnipeg, Manitoba
R3H OK1
Phone: (204) 632-5126

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

SPIKE (tebuthiuron)

1. FORMULATIONS: 80% wettable powder (Spike 80WP)
   Available in 2 kg bag or 20 kg box

   5% granular (Spike 5G)
   Available in 7 kg shaker box or 20 kg drum

2. REGISTERED MIXES: None

   Mix restrictions: Not applicable
   Mixing with other pesticides: Not recommended

3. CROPS: Non-cropland only.

4. WEEDS CONTROLLED: Spike is non-selective. Controls both annual and perennial weeds.

   Weeds controlled include: Bladder campion, Canada thistle, common milkweed, field horsetail, foxtail barley, kochia, lamb's-quarters, nodding thistle, perennial sow-thistle, redroot pigweed, Russian thistle, smartweeds, spotted knapweed, stinkweed, tall buttercup, toadflax, western snowberry (buckbush).

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Spike can be used throughout the growing season and up to September 15th. Best results will be obtained if applied shortly before or at the time plant growth begins.

7. HOW TO APPLY:

   A) Spike 5G

With:	A Spike 5G shaker box or granular spreader.
Rate:	44.5-91.0 kg/ac **(110-225 kg/ha)** (Spike 5G). Apply the higher rates for difficult to control weeds. Greater residual effect can be expected when higher rates are used.
Water Volume:	Not applicable
Incorporation:	Not applicable
Pressure:	Not applicable
Ground Speed:	Not applicable
Nozzles:	Not applicable
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a respirator and goggles when opening bags, boxes or drums of Spike.

   B) Spike 80WP

With:	Ground spray equipment
Rate:	2.225-4.452 kg/ac **(5.5-11 kg/ha)**. Apply the highest rate for very difficult to control weeds, and on areas where longer term weed control is desired.
Water Volume:	100-180 L/ac **(250-450 L/ha)**
Incorporation:	Not applicable
Pressure:	140-300 kPa
Ground Speed:	Not specified
Nozzles:	Standard nozzles delivering a minimum of 100 L/ac **(250 L/ha)**
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a respirator and goggles when opening bags, boxes or drums of Spike.

8. SPRAYING TIPS:

   (a) Do not apply on areas where bare ground is undesirable.
   (b) Do not apply where soil erosion may be a problem.
   (c) Do not apply Spike within 1 times the height of any desirable trees.
   (d) Do not use on walks, driveways, lawns, patios, tennis courts or similar areas where the roots of desirable trees may extend.
   (e) When using Spike 80WP keep the chemical suspended at all times by constant agitation.
   (f) If by-pass agitation is used the return line should terminate at the bottom of the tank to minimize foaming.
   (g) Clean all traces of Spike from application equipment after use. Remove nozzle tips and screens and rinse thoroughly. Flush the tank, pump, hoses and boom with several changes of water.

9. HOW IT WORKS: Spike 80WP and 5G are surface applied and depend upon rainfall to move them into the soil. Spike must be taken up by the weed roots to be effective and it kills the weed by inhibiting photosynthesis. The plants turn yellow and then die. Because Spike must be carried downward into the soil by moisture, the speed of kill depends upon how deeply rooted the target weed is and the amount of rainfall. The initial kill given by Spike is slow but once the product is established in the soil, it will provide extremely effective and long-term weed control.

10. EXPECTED RESULTS: Vegetation present on the treated area will turn brown and die. A complete kill of vegetation would be expected after one growing season. No new growth will appear for several years resulting in bare ground. Duration of control will depend upon the amount of chemical applied, soil-type and environmental conditions.

Conditions under which poor results may be expected:

1. Inadequate application rate.
2. Application onto frozen ground.
3. Application on areas subject to severe soil erosion.

11. EFFECTS OF RAINFALL: Rainfall will activate the Spike by carrying it into the root zone.

12. MOVEMENT IN THE SOIL: Once moved into the soil by rainfall, Spike will leach vertically with time. Spike will not move laterally once it is in the soil.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Not applicable
Grazing Restrictions: Not applicable
Crop Use After Hail: Not applicable
Succeeding Crops: Spike is a non-selective residual herbicide. It should only be used on non-cropland where bare ground is desired.

14. TOXICITY:

- has low acute toxicity to mammals
  oral LD_{50} rats = 644 mg/kg
- no short-term or long-term human health problems have been associated with Spike when used according to label
- slightly toxic to fish and birds

15. PRECAUTIONS AND FIRST AID: Use safety measures to avoid breathing in dust. Avoid contact with skin and eyes.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.

16. STORAGE: Store in a dry place.

17. WHERE AVAILABLE:

80WP – Able Vegetation Management, Ace Vegetation Control, Midland Vegetation Control, Molsberry-Division of Reichhold Chemicals, Van Waters and Rogers.
5G – Able Vegetation Management, Ace Vegetation Control, Midland Vegetation Control, Molsberry-Division of Reichhold Chemicals, Van Waters and Rogers, Alberta Wheat Pool, Cargill Grain, Federated Co-operatives, Pioneer Grain.

Additional information available from:

Elanco
Division Eli Lilly Company Canada Inc.
Unit #3, 9829 – 44 Avenue
Edmonton, Alberta
T6E 5E6
Phone: (403) 436-7145

STAMPEDE 360 (propanil)

1. FORMULATIONS: Emulsifiable concentrate; 360 g/L
   Available in 22.7 L container.

2. REGISTERED MIXES: Stampede 360 + MCPA ester
   Stampede 360 + 2,4-D amine or ester
   (wheat and durum)

Mixing Procedures and Restrictions: Fill spray tank half full of water, add the required amount of MCPA or 2,4-D and then add measured amount of Stampede 360. Engage agitator and continue filling with water to the required total volume. Agitate at least 5 minutes immediately before spraying. Water used should be 10°C or warmer. Spray the solution within 6 hours of mixing. Drain and flush sprayer tank and lines at end of each day's spraying.

Mixing With Other Pesticides: Stampede 360 **should not** be tank mixed with fertilizer solutions, spray adjuvants, insecticides or any other herbicide, except MCPA ester or 2,4-D amine or ester. A 3 day interval should be allowed before or after an application of Stampede 360 and another herbicide. If an insecticide treatment is required, use Furadan, waiting a minimum of 5 days after Stampede 360 application in wheat and 10 days in barley. Dimethoate (Cygon TM) or Malathion may also be used, but allow a minimum interval of 14 days following a Stampede 360 application. Crops grown from seed treated with dual purpose (fungicide/insecticide) seed dressings may be treated with Stampede 360. Do not apply Stampede 360 in fields to which Atrazine has been applied during the previous two years.

3. CROPS:

Crops	**Stage**	**Tank-mix Product/Rates**	
Spring wheat, durum, barley, oats	2-5 leaf	Stampede 360 1.113 L/ac	+ MCPA Ester 500 + 0.223 L/ac
Flax	5-12 cm	**(2.75 L/ha)**	+ **(.55 L/ha)**
Spring Wheat Durum Wheat	3-5 leaf	Stampede 360 1.113 L/ac **(2.75 L/ha)**	+ 2,4-D LV Ester 600 + 0.267 L/ac + **(0.66 L/ha)**
Spring Wheat Durum Wheat	3-5 leaf	Stampede 360 1.113 L/ac **(2.75 L/ha)**	+ 2,4-D Amine 500 + 0.486 L/ac + **(1.2 L/ha)**
Spring Wheat	3-5 leaf	Stampede 360 1.113 L/ac **(2.75 L/ha)**	+ 2,4-D LV Ester 600 + 0.405 L/ac + **(1.0 L/ha)**

Underseeding: Not recommended

4. WEEDS CONTROLLED:

Stampede 360 + MCPA Ester – Green foxtail (wild millet, pigeon grass), yellow foxtail, wild buckwheat, Tartary buckwheat, redroot pigweed, lamb's-quarters, smartweed (rosette stage), shepherd's-purse, bluebur, smartweed, lady's-thumb, wild mustard, volunteer rapeseed (canola), kochia, flixweed.

Stampede 360 + 2,4-D – Same weeds as above plus Russian thistle.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Under normal conditions apply when the majority of green foxtail are in the 3 leaf stage and less than 2.5 cm in height. Broadleaf weeds should be in the 2-4 leaf stage. When soil moisture is deeper than 5 cm apply when green foxtail is in the 2-3 leaf stage. Cereal and flax crops should be in the appropriate stage range relative to tank mix being used.

Cereal crops must be in the 2-5 leaf stage and flax must be 5-10 cm in height at time of application.

Application should be made within 17 days of crop emergence (21 days after seeding). Do not spray when temperature exceeds 30°C.

7. HOW TO APPLY:

With:	Ground equipment: low pressure field sprayers and large commercial floater-type equipment.
Rate:	1.113 L/ac **(2.75 L/ha)** [22.7 L pail treats 20 ac (8.0 ha)] tank-mixed with the appropriate rate of 2,4-D or MCPA.
Water Volume:	Regular low pressure field sprayers – 40 L/ac **(100 L/ha)**. Floater type equipment – 60 L/ac **(150 L/ha)**
Incorporation:	Not applicable
Pressure:	275 kPa
Ground Speed:	8 km/h for field sprayers, 20 km/h or less for floaters

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Nozzles: Only flat fan nozzles capable of delivering 40 L/ac **(100 L/ha)** are recommended for use with regular spray equipment. All other nozzles are not recommended for use. The use of aircraft or Spra-coupes are not recommended for Stampede 360 application.

Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening containers of Stampede.

8. SPRAYING TIPS:

(a) If weather has been hot and dry and relative humidity low, spraying should be restricted to early morning or evening.
(b) Do not apply Stampede 360 when daily maximum temperatures are not expected to exceed 10°C.
(c) Correct spray timing is essential for satisfactory results. Follow all recommendations for timing under various conditions.
(d) Thorough spray coverage is necessary for effective weed control.
(e) 80° nozzles are more effective that 65° nozzles.
(f) Follow restrictions concerning applications of other herbicides as well as insecticides.
(g) Do not apply if crop is under severe stress or if frost is expected within 24 hours after application.

9. HOW IT WORKS: Stampede 360 rapidly enters the foliar portion of plant, causing breakdown of cell walls as well as interference with the cellular metabolism of susceptible weed species. Activity is primarily contact, therefore, thorough spray coverage is necessary for optimum weed control. Also, susceptible weeds tend to become tolerant as they mature past the 4 leaf stage. Stress conditions will trigger a hardening off process and hasten the development of tolerance to chemical control.

10. EXPECTED RESULTS:

Green foxtail and broad-leaf weeds: Affected weeds turn brown in 3-5 days and have a "burnt-off", or desiccated, appearance. Weeds past the recommended stage will show extensive browning, but some degree of green, photosynthesizing tissue remains. New tissue is produced, and the weed will recover. Weeds emerging after spraying are unaffected.

Crops: Temporary yellowing, paling and leaf tip burn are usually noticed, generally more pronounced in oats and barley than in wheat. Flax shares the same general symptoms. The effects normally disappear 10-14 days after treatment. All new growth develops normally and yields are not reduced. Resultant weed control may keep the crop green and growing longer. Under stress conditions, a slight delay in crop maturity may be noticed. Frost within 24 hours after a Stampede 360 application, or treatment after the 5 leaf stage of cereals, may cause long-term crop injury.

Conditions under which poor results may be expected:
1. Applications made later than recommended.
2. Inadequate spray coverage due to low water volume, faulty equipment or interception of spray by a mature, dense crop and weed canopy.
3. Stress conditions result in the earlier development of weed resistance and an increased potential for crop injury.

11. EFFECTS OF RAINFALL: More than 1 hour after application will not affect performance.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Observe the same spray precautions for Stampede 360 tank mixed with 2,4-D or MCPA as recommended for 2,4-D or MCPA alone.
Grazing Restrictions: None on label
Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- has slightly high acute toxicity to mammals
  oral LD_{50} rats = 560 mg/kg (technical)
- toxicity of formulation lower than technical component
- **has potential to cause chlorachne** – a skin disease in man following long-term exposure

15. PRECAUTIONS AND FIRST AID: Avoid skin exposure to this product since it may cause skin problems.

- If on skin, wash off immediately.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, **do not induce vomiting because of petroleum distillates** in the formulation. Symptoms of poisoning may be giddiness, intoxication and headache. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Heated storage not required. If material is stored below -18°C it is advisable to hold in a warm place and agitate pails. Any crystal formulation will redissolve, and activity will remain unaffected.

17. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain, Federated Co-operatives, Pfizer Chemical Dealers, Pioneer Grain and United Grain Growers.

Additional information available from:

Rohm and Haas Canada Inc.
Prairies Regional Office
Suite #17, 830 King Edward St.
Winnipeg, Manitoba
R3H OP5
Phone: (204) 774-1755

Rohm and Haas Canada Inc.
18 Oakbury Place, S.W.
Calgary, Alberta
T2V 4A2
Phone: (403) 281-0831

STAMPEDE CM (propanil + MCPA)

1. FORMULATIONS: Emulsifiable concentrate: 460 g/L
(360 g/L propanil + 100 g/L low volatile MCPA ester)
Available in 22.7 L containers.

2. REGISTERED MIXES: None

Mixing Procedures and Restrictions: Fill spray tank half full with water. Add Stampede CM, engage agitator and continue filling. Agitate at least 5 minutes immediately before spraying. Water used should be 10°C or warmer. Spray Stampede CM within 6 hours of mixing. Drain and flush sprayer tank and lines at the end of each day's spraying.

Mixing with other Pesticides: Do not tank mix Stampede CM with any herbicide, insecticide, spray adjuvant, or fertilizer solution. A 3 day interval should be allowed before or after an application of Stampede CM and another herbicide. If an insecticide treatment is required, use Furadan, waiting a minimum of 5 days after Stampede CM application in wheat and 10 days in barley. Dimethoate (Cygon TM) or Malathion may also be used, but allow a minimum interval of 14 days following a Stampede CM application. Do not apply Stampede CM in fields to which Atrazine has been applied during the previous two years. Crops grown from seed treated with dual purpose (fungicide/insecticide) seed dressings may be treated with Stampede CM.

3. CROPS: All varieties of barley and spring seeded wheat (including durum), flax and oats.

Underseeding: Not recommended

4. WEEDS CONTROLLED: Buckwheat (Tartary and wild), foxtail (green and yellow), lamb's-quarters, redroot pigweed, smartweeds (annual) at the 1-4 leaf stage; bluebur, flixweed, kochia, volunteer rapeseed, wild mustard at the seedling stage; shepherd's-purse and stinkweed at the seedling or rosette stage.

5. WEEDS SUPPRESSED: None

6. WHEN APPLIED: Under normal conditions apply at the 3 leaf and no later than the 4 leaf stage of green foxtail (plants less than 2.5 cm in height). When soil moisture is deeper than 5 cm, apply when green foxtail is at the 2-3 leaf stage. Susceptible broad-leaf weeds are expected to be controlled at this time.
Cereal crops must be at the 2-5 leaf stage and flax must be between 5 and 12 cm in height at time of application. Do not spray flax when temperatures exceed 30°C.

7. HOW TO APPLY:

With:	Ground Equipment: low pressure field sprayers and large commercial floater-type equipment
Rate:	1.113 L/ac **(2.75 L/ha)**. One 22.7 L pail treats 20 ac (8.0 ha).
Water Volume:	Regular low pressure sprayers – 40 L/ac **(100 L/ha)**. Floater type equipment – 60 L/ac **(150 L/ha)**
Incorporation:	Not applicable
Pressure:	275 kPa
Ground Speed:	8 km/h field sprayers 20 km/h or less for floaters
Nozzles:	Only flat fan nozzles capable of delivering 40 L/ac **(100 L/ha)** are recommended with regular spray equipment. All other nozzles are not recommended.
Floaters:	Apply 60 L/ac **(150 L/ha)** spray solution. Flood nozzles can be used if spaced to obtain complete overlap of spray pattern. The use of aircraft or Spra-Coupes for application is NOT recommended.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of Stampede concentrate.

8. SPRAYING TIPS:

(a) Correct spray timing is essential.
(b) Thorough spray coverage is necessary for effective weed control.
(c) 80° nozzles are more efficient that 65° nozzles.
(d) Follow restrictions concerning applications of other herbicides as well as insecticides.
(e) Do not apply if crop is under severe stress or if frost is expected within 24 hours.
(f) If weather has been hot and dry and relative humidity low, spraying should be restricted to early morning or evening.
(h) Do not apply Stampede CM when daily maximum temperatures are not expected to exceed 10°C.

9. HOW IT WORKS: Rapidly absorbed by foliage, Stampede CM causes breakdown of cell walls as well as interference with the cellular metabolism of susceptible weed species. The MCPA component causes phenoxy-specific symptoms. Activity is essentially contact, and thorough spray coverage is necessary for optimum weed control. Spraying as recommended insures complete coverage before tall, dense weed/crop growth results in a canopy effect which screens the weeds from the spray and leads to poor weed control. Also, susceptible weeds become tolerant as they mature past the 4 leaf stage. Stress conditions cause a hardening off process and hasten the development of tolerance to chemical control.

10. EXPECTED RESULTS: Green foxtail and broad-leaf weeds: Within 3-5 days, affected weeds turn brown and have a "burnt off" or desiccated appearance. Weeds past the recommended stage will show extensive desiccation, but some portion

of green photosynthesizing tissue remains. New plant growth may be generated, and the weed will recover. Weeds emerging after spraying are unaffected.

Crops: Temporary yellowing, paling and leaf tip burn will usually be noticeable, and generally more pronounced in barley than wheat. These effects are temporary and usually disappear 10-14 days after treatment. All new growth develops normally and yields are not reduced. Applied under extreme stress conditions, Stampede CM may cause a slight delay in crop maturity, and some suppression of growth in flax. This will be offset by increased yield due to weed control. Frost within 24 hours of treatment or application after the 5 leaf stage of wheat and barley may cause long-term crop injury.

Conditions under which poor results may be expected:
1. Applications made at a later than recommended stage of weed growth.
2. Inadequate spray coverage due to low water volumes, faulty or improper equipment or interception of spray by a mature, dense crop and weed canopy.
3. Stress conditions will trigger earlier development of weed resistance and a potential for crop injury.

11. EFFECTS OF RAINFALL: Rainfall more than 1 hour after treatment will not affect performance.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger is low; MCPA has a low volatility. Do avoid drift to phenoxy susceptible crops such as rapeseed, vegetables, and ornamentals.
Grazing Restrictions: None on label
Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 1,950 mg/kg dermal LD_{50} rabbits = 2,190 mg/kg
- **propanil has potential to cause chlorachne** – a skin disease in man following prolonged exposure

15. PRECAUTIONS AND FIRST AID: Avoid skin exposure to this product since propanil may cause skin problems. Do not breathe in spray mist.

- If on skin, wash off **immediately** with soap and water.
- If in eyes, wash for 15 minutes. Get medical attention.
- If swallowed, **do not induce vomiting.** Symptoms of poisoning may be giddiness, intoxication and headache. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Heated storage is not required. If material is stored below –18°C, it is advisable to place in a warm location for several days and agitate pails. Any crystal formation will redissolve, and activity will remain unaffected.

17. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain, Federated Co-operatives, Pfizer Chemical Dealers, Pioneer Grain, and United Grain Growers.

Additional information available from:

Rohm and Haas Canada Inc.
Prairies Regional Office
Suite #17, 830 King Edward St.
Winnipeg, Manitoba
R3H OP5
Phone: (204) 774-1755

Rohm and Haas Canada Inc.
18 Oakbury Place, S.W.
Calgary, Alberta
T2V 4A2
Phone: (403) 281-0831

SWEEP (paraquat)

1. FORMULATIONS: Water soluble solution 250 g/L
   Available in 20 L containers

2. REGISTERED MIXES: Sweep + bromoxynil + MCPA
   Sweep + dicamba + 2,4-D
   Sweep + 2,4-D
   Sweep + Lorox + MCPA
   Sweep + MCPA

   Mix restrictions: When using amine formulations use immediately.
   Mixing with other pesticides: Not applicable.

3. CROPS: Summerfallow

   Underseeding: Not applicable

4. WEEDS CONTROLLED: Annual grasses and when tank-mixed with the appropriate broad-leaf herbicide, annual broad-leaf weed control as well.

5. WEEDS SUPPRESSED: Most perennial weeds

6. WHEN USED: At the 2-4 leaf stage of annual weeds.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	0.911 L/ac **(2.25 L/ha)** for annual grass control and when tank-mixed with broad-leaf herbicides, use the rates of those materials recommended for use in the situation involved.
Water Volume:	40 L/ac **(100 L/ha)** Use higher volumes when foliage is dense or weeds are in the 4 leaf stage.
Incorporation:	Not applicable
Pressure:	300 kPa
Ground Speed:	9 km/h
Nozzles:	All standard nozzles delivering the correct volume.
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated Sweep.

8. SPRAYING TIPS:

   (a) Apply Sweep + Lorox + MCPA mix only once per year, and in the spring.
   (b) Use high volume, low pressure-type spraying equipment to apply the appropriate number of L/ac or L/ha. Foliage must be thoroughly covered to obtain good results.
   (c) Applications made on cloudy days, during dull sunlight or just prior to or during periods of darkness will generally increase the subsequent effectiveness of the treatment.
   (d) Do not apply with mist blowers.
   (e) It is important to thoroughly wash equipment after spraying – use a wetting agent (Agral 90 at 60 mL/100 L of water), flush and spray out, then thoroughly rinse with clean water. When possible, the equipment should be filled with clean water and left overnight. Spray out before storing equipment or using for other materials.

9. HOW IT WORKS: Sweep is absorbed by all leaf and stem surfaces, but it does not move in the plant. Once inside the plant Sweep interferes with photosynthesis in the plant. This is followed by yellowing and eventual death of the plant.

10. EXPECTED RESULTS:

    Weeds: Sweep provides immediate, fast and virtually complete annual grass control. Repeat applications will be necessary when new weeds emerge. Usually yellowing will occur within a few hours of application. Desiccation of the plant will continue rapidly and eventual death will occur. When tank-mixed with a broad-leaf herbicide, Sweep will provide control of most annual weeds.

    Crop: Not applicable.

    Conditions under which poor results may be expected:
    1. Rain prior to the spray solution drying on plant.
    2. Use clean (non-turbid) water for spraying Sweep, as muddy water will reduce effectiveness.
    3. Inadequate coverage of green foliage.

11. EFFECTS OF RAINFALL: Once the spray solution has dried on the plant tissue, rain will not reduce the effectiveness of Sweep.

12. MOVEMENT IN SOIL: None. Sweep binds to the soil and becomes biologically unavailable.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Avoid application or drift onto crops, ornamental plants, lawns, grazing areas or other desirable growth.
Grazing Restrictions: Not applicable
Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- has **very high** acute mammalian toxicity
  - oral LD_{50} rats = 120 mg/kg
  - dermal LD_{50} rabbits = 480 mg/kg
- **symptoms of acute poisoning may occur in man shortly after use**
- **long-term inhalation exposure to Sweep may cause lung damage**

15. PRECAUTIONS AND FIRST AID: Do not inhale Sweep spray mist or fumes. Therefore avoid spraying on windy days. Use of a respirator while spraying is recommended.

- If on skin, wash off **immediately** with soap and water.
- If in eyes, wash with clean water for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
- Take labelled container to doctor.
- Take this information on Sweep with you to doctor.

FOR PHYSICIAN: The following information is relevant because **Sweep** contains paraquat. If swallowed, give stomach wash-out and test urine and gastric aspirate for paraquat. If positive, give up to 1 litre of absorbent suspension (30% Fuller's Earth, activated charcoal or amberlite resin) mixed with a purgative (Mg_2SO_4, $NaSO_4$ or mannitol). Repeat administration of absorbent suspension for the next 24 hours, plus purgatives as required. Maintain and monitor electrolyte and fluid status daily. Consider haemodialysis or haemoperfusion, using charcoal column. Delay oxygen as long as possible.
If in eyes, treat symptomatically, using antibiotics and steroids as necessary.
Emergency telephone number: (416) 643-4123 8:00 am – 4:45 pm After hours: (416) 528-6771 (state as calling for Chipman).

16. STORAGE: Sweep will crystallize if subjected to freezing temperatures. It, therefore, requires heated storage.

17. WHERE AVAILABLE: From major grain companies and many independent farm supply dealers.

Additional information available from:

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421 or Toll Free: 1 (800) 665-4657

TARGET (MCPA + mecoprop + dicamba)

1. FORMULATIONS: Water soluble solution containing 275 g/L MCPA +
62.5 g/L mecoprop + 62.5 g/L dicamba.
Available in 10 L plastic jugs.

2. REGISTERED MIXES: Target + Sencor 500 F
Target + Lorox L or Afolan F

3. CROPS: Hard red spring and durum wheat, barley, oats.

4. WEEDS CONTROLLED: Buckwheat (Tartary and wild), corn spurry, cow cockle, hemp-nettle, flixweed, knotweed, lamb's-quarters, mustards, pigweed (prostrate, redroot), shepherd's-purse, smartweeds (annual), sow-thistle (annual), stinkweed.

5. WEEDS SUPPRESSED: Canada thistle, field bindweed, hedge bindweed.
Program for gradual eradication of Canada thistle:
(a) an in-crop application of Target.
(b) the following year, summerfallow and treat with Target.

6. WHEN USED: Wheat – 2-5 leaf stage
Barley – 2-3 leaf stage
Oats – 2-5 leaf stage
Summerfallow – discontinue cultivation in early July and treat with Target when thistles are in the early bud stage.
Weed growth stage – 2-5 leaf stage
Note: Treatment at other than recommended crop stage may cause injury.

7. HOW TO APPLY:

With: Equipment that will apply 40 L/ac **(100 L/ha)**
Rate: 0.405-0.607 L/ac **(1.0-1.5 L/ha)** [At 0.405 L/ac **(1.0 L/ha)**, one 20 L pail will treat 49 ac **(20 ha)**]. Use 0.607-0.810 L/ac **(1.5-2.0 L/ha)** on summerfallow for thistle control.
Water Volume: 40 L/ac **(100 L/ha)**
Incorporation: Not applicable
Pressure: Sufficient for good coverage
Ground Speed: Sufficient for good coverage
Nozzles: All standard and low pressure nozzles delivering 40 L/ac **(100 L/ha)**
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of concentrated Target.

8. SPRAYING TIPS:

(a) For control of hemp-nettle, apply when the weeds are young (prior to the second pair of leaves).
(b) Use the higher rate when weeds are beyond the 3 leaf stage, when weed densities are high or under adverse weather conditions.

9. HOW IT WORKS: Target is a combination of three systemic hormonal herbicides which accummulate in the growing point of susceptible plants, produce abnormal growth and disrupt the transport system in plants.

10. EXPECTED RESULTS:

Weeds: Due to slow translocation of the chemical in the plant and the influence of growing conditions, effect on weeds becomes visible within 7-14 days after spraying – leaves curl, leaf petioles twist, leaf edges turn brown, whole plant ceases growth and eventually turns brown and dies.

Crop: Improper application can result in abnormal bending at the nodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels and sterile florets.

Conditions under which poor results may be expected:
1. Inadequate coverage.
2. Rainfall shortly after application.
3. Weeds over-mature.

11. EFFECTS OF RAINFALL: Do not spray if rain is expected within 3 hours.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Tomatoes, sugar beets, sunflowers, beans, turnips, cauliflower, cabbage, ornamentals and fruit crops are very sensitive to drift.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Grazing Restrictions: No haying or grazing restrictions at recommended rate.
Crop Use After Hail: No restrictions.
Succeeding Crops: No restrictions.

14. TOXICITY:

- has low acute mammalian toxicity
  oral LD_{50} rats = 1,028 mg/kg
- **long-term continuous exposure to this product may produce enlarged kidneys**
- non-toxic to fish
- LD_{50} of dicamba to bees = 3.6 micrograms/bee

15. PRECAUTIONS AND FIRST AID: Avoid prolonged skin or inhalation exposure to Target.

- If on skin, wash off immediately with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Give plenty of milk or water to drink. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Heated storage only.

17. WHERE AVAILABLE: Green Cross Product Dealers.

Additional information available from:

Green Cross Products
820 – 26 Street N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

TORCH (bromoxynil)

1. FORMULATIONS: Emulsifiable concentrate, 227 g/L
   Available in 20 L containers

2. REGISTERED MIXES: Torch + Avenge
   Torch + 2,4-D amine
   Torch + 2,4-D ester
   Torch + Hoe-Grass
   Torch + MCPA amine
   Torch + MCPA ester
   Torch + Roundup
   Torch + Avenge 200C + MCPA ester
   Torch + 2,4-D estemine
   Torch + MCPA estemine
   Torch + MCPA-K

   Mix restrictions: If the amine, estemine or K-Salt of 2,4-D is added, mix into the water first, then add Torch.
   Mixing with other pesticides: Not recommended

3. CROPS: Spring wheat, oats, barley, triticale, flax, canary seed, sweet and field corn. Seedling grasses grown for seed: brome, meadow fescue, orchard grass, timothy, wheat grass (crested, tall, slender, intermediate), and Russian wild rye.

   Underseeding: Not recommended

4. WEEDS CONTROLLED: Annual smartweeds, buckwheat (tartary and wild), common groundsel, cow cockle, kochia, knawel, lamb's-quarters, night-flowering catchfly, redroot pigweed, Russian thistle, scentless chamomile, stinkweed, wild mustard.

5. WEEDS SUPPRESSED: None

6. WHEN USED:

   a) Weeds
      - Seedling to 4 leaf stage for cow cockle and wild mustard.
      - Seedling to 5 cm high for Russian thistle.
      - Torch gives best results when weeds are young and actively growing. Spraying past the 6 leaf stage may result in reduced control.

   b) Crops
      - Wheat, barley & oats: 2 leaf to early flag leaf stage.
      - Flax: 5-10 cm high.
      - Canary seed: 3 to 5 leaf stage.
      - Corn: Apply before crop is 25 cm height.

7. HOW TO APPLY:

   With: Ground Sprayer
   - Spray Coupe application is not recommended
   - Reduced control may be expected with floaters, unless modifications for post-emergence application are made:
     - use 60 L/ac **(150 L/ha)** water
     - use 275 kPa
     - DO NOT exceed a forward speed of 18 km/h
     - DO NOT use flood-jet tips

   Rate: Wheat, barley, oats: 0.506-0.607 L/ac **(1.25-1.5 L/ha)** Flax: 0.506 L/ac **(1.25 L/ha)** Canary seed: 0.506-0.607 L/ac **(1.25-1.5 L/ha)** Corn (field and sweet): 0.607-0.708 L/ac **(1.5-1.75 L/ha)** [One 20 L container treats 39.5 ac **(16 ha)** at the 0.506 L/ac **(1.25 L/ha)** rate]
   - Use the higher rate when weeds are past the 4 leaf stage
   - Under a heavy infestation of wild mustard or redroot pigweed (150 plants/m^2), apply the higher rate of Torch 0.708 L/ac **(1.5 L/ha)**
   - In corn, use the higher rate of application for control of triazine resistant annual broad-leaf weeds including lamb's-quarters and redroot pigweed.

   Water Volume: Wheat, barley, oats, flax, and canary seed – 40 L/ac **(100 L/ha)**. Corn – 60 L/ac **(150 L/ha)**
   Incorporation: Not applicable
   Pressure: 275 kPa
   Ground Speed: 9 km/h
   Nozzles: Flood-jet nozzles and low pressure nozzles are not recommended.
   Protective Equipment: Standard protective clothing used when applying herbicides.
   - plus a face shield and apron when opening containers of Torch concentrate.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

8. SPRAYING TIPS:

   (a) Do not apply to wheat, barley or oats during or after the boot stage or on those crops underseeded to legumes.
   (b) Do not apply to corn or flax when plants are under stress: drought conditions, hot humid weather with daytime temperatures over 30°C.
   (c) For best results, broad-leaf weeds should be in the seedling to 4 leaf stage of growth. Use higher rate when weeds are past the 4 leaf stage.

9. HOW IT WORKS: The herbicide is absorbed by the foliage but not translocated once absorbed. It inhibits the plant's photosynthesis and respiration, thereby killing it.

10. EXPECTED RESULTS:

Weeds: Affected plant will turn brown within 3-5 days of application. More active when weeds are growing rapidly.

Crop: In flax, some leaf burn and retarded growth may delay maturity 2 to 3 days. Do not treat when flax plants are under stress. In corn, some leaf burn may occur. Do not treat when corn plants are under stress.

Conditions under which poor results may be expected:
1. Late spraying: majority of weeds past the 5-6 leaf stage.
2. Inadequate coverage.
3. Too low a spray pressure.

11. EFFECTS OF RAINFALL: Resistant to removal by rainfall.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is low
Grazing Restriction: None
Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- has **high** acute mammalian toxicity
  oral LD_{50} rats = 245 mg/kg
- symptoms of acute poisoning may appear in man shortly after use
- no long-term health problems have been associated with this product when used according to label
- very toxic to fish

15. PRECAUTIONS AND FIRST AID: Torch is toxic and care must be taken not to contaminate the skin or to inhale the fumes or spray mist.

- If on skin, wash off immediately with soap and water.
- If in eyes, wash for 15 minutes with clean water and get medical attention.
- If swallowed, **do not induce vomiting.** Get medical attention immediately.
- Take labelled container to doctor.

16. STORAGE: Store in heated area. Do not freeze. Torch may crystallize if frozen. If crystallization has taken place, warm the drum in warm room or sun, with frequent agitation until crystals are dissolved. No deterioration in 2 years storage time.

17. WHERE AVAILABLE: Alberta Wheat Pool, United Grain Growers, United Farmers of Alberta, Oliver Agricultural Supply, Pioneer Grain, Cargill Grain, Shell Farm Supply Dealers, Niagara Chemical Dealers.

Additional information available from:

Allied Chemical Services Ltd.
5507 – 1 Street S.E.
Calgary, Alberta
T2H 1H9
Phone: (403) 253-8471

TORCH DS (bromoxynil)

1. FORMULATIONS: Emulsifiable concentrate, 450 g/L
   Available in 10 L containers

2. REGISTERED MIXES: Torch DS + Avenge
   Torch DS + 2,4-D amine
   Torch DS + 2,4-D ester Torch DS + 2,4-D estemine Torch DS + Hoe-Grass
   Torch DS + MCPA amine
   Torch DS + MCPA ester
   Torch DS + MCPA estemine
   Torch DS + MCPA-K
   Torch DS + Roundup
   Torch DS + Avenge + MCPA ester

   Mix restrictions: If the amine, estemine or K-Salt of 2,4-D or MCPA is added, mix into the water first, then add Torch DS.
   Mixing with other pesticides: Not recommended

3. CROPS: Wheat, oats, barley, fall rye, triticale, flax, canary seed, sweet and field corn and seedling grasses grown for seed: brome, meadow fescue, orchard grass, timothy, wheat grass (crested, tall, slender, intermediate), and Russian wild rye.

   Underseeding: Not recommended

4. WEEDS CONTROLLED: Annual smartweeds, buckwheat (tartary and wild), common groundsel, cow cockle, kochia, knawel, lamb's-quarters, night-flowering catchfly, redroot pigweed, Russian thistle, scentless chamomile, stinkweed and wild mustard.

5. WEEDS SUPPRESSED: None

6. WHEN USED:

   a) Weeds
      - Seedling to 4 leaf stage for cow cockle and wild mustard.
      - Seedling to 5 cm high for Russian thistle.
      - Torch DS gives best results when weeds are young and actively growing. Spraying past the 6 leaf stage may result in reduced control.

   b) Crops
      - Wheat, barley & oats: 2 leaf to early flag leaf stage.
      - Winter wheat and fall rye: From the time the crop commences growth in the spring to the early flag leaf stage.
      - Flax: 5-10 cm high.
      - Corn: Apply before crop is 25 cm height.
      - Seedling grasses: 2-4 leaf stage.

7. HOW TO APPLY:

With: Ground Sprayer
- Spray Coupe application is not recommended
- Reduced control may be expected with floaters, unless modifications for post-emergence application are made:
  - use 60 L/ac **(150 L/ha)** water
  - use 275 kPa
  - DO NOT exceed a forward speed of 18 km/h
  - DO NOT use flood-jet tips

Rate: Wheat, barley, oats: 0.253-0.304 L/ac **(0.625-0.75 L/ha)**
Flax: 0.253 L/ac **(0.625 L/ha)**
Winter wheat and fall rye: 0.304 L/ac **(0.750 L/ha)**
Corn (field and sweet): 0.304-0.354 L/ac **(0.750-0.875 L/ha)**
Canary seed and triticale: 0.253-0.304 L/ac **(0.625-0.750 L/ha)**
Seedling grasses: 0.354 L/ac **(0.875 L/ha)**
- Use the higher rate when weeds are past the 4 leaf stage
- Under a heavy infestation of wild mustard or redroot pigweed (150 plants/m^2), apply the higher rate of Torch DS 0.304 L/ac **(0.750 L/ha)**
- In corn, use the higher rate of application for control of triazine resistant annual broad-leaf weeds including lamb's-quarters and redroot pigweed.

Water Volume: Wheat, barley, oats, fall flax, triticale, canary seed and seedling grasses – 40 L/ac **(100 L/ha)**. Corn – 60 L/ac **(150 L/ha)**
Incorporation: Not applicable
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: Flood-jet and low pressure nozzles are NOT recommended.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening containers of Torch DS concentrate.

8. SPRAYING TIPS:

(a) Do NOT apply to wheat, oats, barley or fall rye during or after the boot stage or on those crops underseeded to legumes.
(b) Do NOT apply to corn or flax when plants are under stress due to adverse growing conditions, especially in periods of drought, stress, high humidity or hot temperature (30°C).
(c) For best results, broad-leaf weeds should be in the seedling to 4 leaf stage of growth. Use higher rate when weeds are past the 4 leaf stage.

9. HOW IT WORKS: Bromoxynil is absorbed by the foliage but not translocated once absorbed. It inhibits the plant's photosynthesis and respiration, thereby killing it.

10. EXPECTED RESULTS:

Weeds: Affected plant will turn brown within 3-5 days of application. More active when weeds are growing rapidly.

Crop: In flax, some leaf burn and retarded growth may delay maturity 2 to 3 days. Do NOT treat when flax plants are under stress. In corn, some leaf burn may occur. Do NOT treat when corn plants are under stress.

Conditions under which poor results may be expected:
1. Late spraying: majority of weeds past the 5-6 leaf stage.
2. Inadequate coverage.
3. Too low a spray pressure.

11. EFFECTS OF RAINFALL: Resistant to removal by rainfall.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Danger from drift is low Grazing Restriction: None
Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- has **high** acute mammalian toxicity
  oral LD_{50} rats = 245 mg/kg
- symptoms of acute poisoning may appear in man shortly after use
- no long-term health problems have been associated with this product when used according to label
- very toxic to fish

15. PRECAUTIONS AND FIRST AID: Torch DS is toxic and care must be taken not to contaminate the skin or to inhale the fumes or spray mist.

- If on skin, wash off immediately with soap and water.
- If in eyes, wash for 15 minutes with clean water and get medical attention.
- If swallowed, **do not induce vomiting**. Get medical attention immediately.
- Take labelled container to doctor.

16. STORAGE: Heated storage is not required.

17. WHERE AVAILABLE: United Grain Growers, United Farmers of Alberta, Alberta Wheat Pool, Pioneer Grain, Cargill Grain, Federated Co-operatives and Oliver Dealers.

Additional information available from:

Allied Chemical Services Ltd.
5507 – 1 Street S.E.
Calgary, Alberta
T2H 1H9
Phone: (403) 253-8471

TORDON (picloram)
AVAILABLE ONLY TO LICENSED APPLICATORS

1. FORMULATIONS: Tordon 10K Pellets:
   10% picloram in clay carrier.
   Tordon 22K Herbicide:
   picloram 240 g/L as potassium salts.
   Tordon 101 Mixture:
   picloram – 60 gm/L + 2,4-D – 240 gm/L
   as triisopropanolamine salts.

2. REGISTERED MIXES: None

3. CROPS: Tordon 101 Mixture and Tordon 10K Pellets are registered for use on non-cropland, energy transmission and transportation corridors. Tordon 22K is registered for use on rangeland, permanent grass pastures and non-cropland. Tordon 22K is also registered for spot treatment on cropland when applied by a licensed pesticide applicator.

4. WEEDS CONTROLLED: Tordon 101 Mixture and Tordon 10K Pellets control most broad-leaf weeds and brush species including conifers. Tordon 22K Herbicide controls most deep rooted perennial weeds including scentless chamomile, diffuse and spotted knapweed, Canada and perennial sow-thistle, Russian knapweed, pasture sage, leafy spurge, field bindweed and toadflax.

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Tordon 101 Mixture and Tordon 22K Herbicide should be applied during periods of active growth. Tordon 1CK Pellets may be applied at any time of year when there is no snow on the ground.

7. HOW TO APPLY:

a) Tordon 10K Pellets

With: Granular spreader, cyclone seeder, fixed or rotary winged aircraft.
Rate: 12.1-16.2 kg/ac **(30-40 kg/ha)** – birch, poplar, cedar, basswood, pin cherry, willow, wild rose and other susceptible species. 16.2-20.2 kg/ac **(40-50 kg/ha)** – alder, maple, fir, spruce*, pine. 38.85 kg/ac **(96 kg/ha)** – tamarack, oak. * for dense stands of black spruce, 20.2-24.3 kg/ac **(50-60 kg/ha)** are suggested.
Water Volume: Not applicable
Incorporation: Not applicable
Pressure: Not applicable
Ground Speed: Not applicable
Nozzles: Not applicable
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a respirator and goggles when opening bags of Tordon 10K Pellets.

b) Tordon 22K Herbicide

With: Ground spray equipment
Rate: 0.445-3.642 L/ac **(1.1-9.0 L/ha)** depending on weeds to be controlled
Water Volume: 80-800 L/ac **(200-2,000 L/ha)**
Incorporation: Not applicable
Pressure: 200-300 kPa
Ground Speed: Not critical
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of liquid Tordon 22K.

c) Tordon 101 Mixture

With: Ground spray equipment Rotary-winged aircraft, providing an appropriate drift control system is employed.
Rate: *Brush control:* 10 L of Tordon 101 Mixture in 1,000 L of water, apply as a drenching spray. For use with rotary-winged aircraft, apply 10.1-14.2 L/ac **(25-35 L/ha)** of Tordon 101 Mixture in 60-80 L/ac **(150-200 L/ha)** of water.
Weed control: Apply 2.83 L/ac **(7 L/ha)** of Tordon 101 Mixture in 80-800 L/ac **(200-2,000 L/ha)** of water.
Cut surface, stump treatments: Dilute Tordon 101 Mixture in a 1:1 ratio with water and apply to exposed surfaces, paying particular attention to covering the inner bark (cambium) layer.
Tree injector: Inject 1 mL of dilute (1:1 in water) Tordon 101 Mixture at intervals of 75 mm between injector wounds around trunk of tree.
Water Volume: Listed above
Incorporation: Not applicable
Pressure: Low volume [80 L/ac **(200 L/ha)** or less total spray]: 300 kPa or less. High volume [80-800 L/ac **(200-2,000 L/ha)** total spray]: as required.

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Ground Speed: As required.
Nozzles: As required. An adequate drift control system should be employed.
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of liquid Tordon 101 Mixture.

8. SPRAYING TIPS:

Tordon 10K Pellets: For spot application on brush, spread Tordon 10K Pellets evenly on the soil over the entire root system and outward to 30 cm beyond the branch tips. Use higher doses to control brush on very sandy, gravelly or rocky soils and in areas where heavy rainfall can be anticipated.

Tordon 101 Mixture: Spray should thoroughly wet all plant parts including foliage, stems and root collars. For hard to kill species such as ash and oak, spray the soil around the root collar as well. Under good growing conditions, applications made up to 3 weeks before frost are usually effective. Applications made when the foliage has lost its normal green color and vigor may not give satisfactory results.

Tordon 22K: For spot treatment on cropland, no one spot should be more than 1 ac **(.4 ha)** in size, and treat no more than 5% of any one field in any one year.

NOTE: Picloram is extremely potent, persistent and water soluble, and small quantities may cause damage to desirable plants. Therefore, do not apply, or otherwise permit any Tordon herbicide to contaminate soil used to grow desirable susceptible plants or to contact susceptible plants such as vegetables, fruit trees, ornamentals, legumes of all types, and other desirable broad-leaf plants. Application should be carried out only when no hazards exist. Do not allow picloram to contaminate water used for irrigation or domestic purpose.

Because of the difficulty of thoroughly cleaning sprayers and other equipment following the use of Tordon herbicides, such equipment should not be used to apply other materials to desirable susceptible plants.

9. HOW IT WORKS: Because Tordon 10K Pellets are applied to the ground they depend on rainfall or surface moisture to break down the pellet; water dissolves the picloram, and carries it into the roots of the target plants. From the roots, the picloram moves to the parts of the plant that are growing actively at the time. At the site, picloram interferes with cell development (which causes leaf cupping and stem distortion), plant respiration, and food reserves thus causing eventual death of the plant.

With Tordon 101 Mixture and Tordon 22K, picloram is absorbed through the leaves and the roots, and then moves to the site of active growth.

The presence of picloram in the soil of the treated area prevents germination of seeds of sensitive plants and protects the area from re-invasion by these plants.

10. EXPECTED RESULTS:

Tordon 10K Pellets: 2 to 3 weeks after the first rainfall after treatment, leaves of affected trees become dull and cupped; orange streaks appear on the stems of poplar trees, leaves then become brown and brittle, as the tree dies.

Tordon 101 Mixture: 2 to 3 weeks after treatment symptoms described above occur.

Tordon 22K Herbicide: Perennial weeds show distorted stems and cupped leaves, which turn yellow and then brown. Usually native grass increases in abundance as a result of reduced competition.

Conditions under which poor results can be expected:

Tordon 10K Pellets:	1) heavy rainfall soon after treatment 2) light sandy soil
Tordon 22K Herbicide:	1) heavy rain soon after treatment 2) light sandy soil
Tordon 101 Mixture:	1) treatment after trees have hardened off for the year 2) stump treatments made in the spring when sap is flowing

11. EFFECTS OF RAINFALL: A light rainfall after treatment is probably beneficial. Heavy rainfall may dissolve and carry picloram away from the target area, or percolate the dissolved picloram out of the root zone of the target plants.

12. MOVEMENT IN SOIL: Picloram is soluble in water and will migrate with that water in pure sand or gravel. Picloram is absorbed to organic matter and is subject to limited movement after absorption, in soils containing more than 0.5% organic matter.

13. GRAZING AND CROPPING RESTRICTIONS: Hay made from treated vegetation may contain picloram, and this picloram will be deposited in the manure of animals consuming this hay.
Therefore, this manure should not be used to grow sensitive crops. It is best to return this manure to a cereal crop field, if possible, for disposal.

When applied as a spot treatment on cropland, picloram may persist in soil for up to 5 years, and prevent the establishment of sensitive crops such as peas, beans, alfalfa, lentils, potatoes, or sunflowers. Where wheat, oats,

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barley and rapeseed are the major crops in the rotation program, the following sequence is suggested to start the year after treatment:

First Year: Oats or rapeseed
Second Year: Oats, rapeseed or barley
Third Year: Oats, rapeseed, barley or wheat

While there may be some reduction in yield in the first year of this program, this is usually offset by the benefits of weed control obtained.

Legumes may not be established in a pasture in significant amounts for several years after a Tordon herbicide treatment. If legumes are considered essential in a pasture, do not use Tordon herbicide.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 8,200 mg/kg (technical picloram)
  = 5,000 mg/kg (Tordon 10K Pellets)
  = 10,330 mg/kg (Tordon 22K)
  = 8,000 mg/kg (Tordon 101)
- no short-term or long-term human health problems have been associated with any of those products when used according to label
- may cause eye irritation
- no dioxin is present in the 2,4-D of Tordon 101 Mixture
- non-toxic to fish and bees

15. PRECAUTIONS AND FIRST AID: Avoid skin and eye contact and do not inhale the spray mist or dust.

- If the chemical is on the skin, wash off with soap and water.
- If dust or spray gets into eyes, wash for 15 minutes with clean water and get medical attention if serious.
- If either of Tordon 22K or 101 is swallowed, induce vomiting by giving 15 mL syrup of ipecac or by sticking your finger down the throat. Give plenty of milk or water to drink. Get medical attention.
- Take labelled container with you to the doctor.

16. STORAGE:

Tordon 10K Pellets: Store in a cool, dry place.
Tordon 22K Herbicide and Tordon 101 Mixture: Store in a cool, dry place. Do not freeze. If freezing occurs, warm to 0°C and mix well before using.

17. WHERE AVAILABLE: Dow Chemical Canada Inc., Midland Vegetation Control Inc.

Additional information available from:

Dow Chemical Canada Inc.
Suite 2412, 10025 Jasper Avenue
Edmonton, Alberta
T5J 1S6
Phone Toll Free: 1-800-661-6436

TORDON 202C (picloram + 2,4-D)

1. FORMULATIONS: Picloram 12 g/L + 2,4-D 200 g/L
   Available in 20 L containers

2. REGISTERED MIXES: None

3. CROPS: Wheat and barley

   Underseeding: Not recommended.

4. WEEDS CONTROLLED: Buckwheat (Tartary and wild), cocklebur, green smartweed, lamb's-quarters, redroot pigweed, Russian thistle, wild mustard and spring seedlings of stinkweed and dandelion.

5. WEEDS SUPPRESSED: Scentless chamomile, Canada thistle.

6. WHEN USED: 3-5 leaf stage of crop. Seedling (2-4 leaf) stage of weeds.

7. HOW TO APPLY:

With:	Ground equipment
Rate:	0.607-0.809 L/ac **(1.5-2.0 L/ha)** [At 0.607 L/ac **(1.5 L/ha)** rate, one 20 L container will treat 32.8 ac **(13.3 ha)**]
Water Volume:	40 L/ac **(100 L/ha)** Incorporation: Not applicable
Pressure:	275 kPa
Ground Speed:	9 km/h
Nozzles:	All standard, low pressure nozzles delivering 40 L/ac **(100 L/ha)**
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS: Treat during warm weather when the weeds are young and growing actively.

9. HOW IT WORKS: Absorbed by leaf and stem surfaces and translocated throughout the plant to the growing points. Also absorbed by roots through the soil. Remains in the soil to control the late germinating weed seedlings.

10. EXPECTED RESULTS: The weeds will not die immediately after treatment but will slow and cease growth and not compete with the crop nor interfere with harvest. Use higher rates under dry or cool conditions.

11. EFFECTS OF RAINFALL: Rainfall within 4 to 6 hours of application may reduce activity.

12. MOVEMENT IN SOIL: Picloram degrades very slowly in soil and water, and may be leached out, after rainfall, from soils low in organic matter.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Small amounts of picloram and 2,4-D can damage certain desirable broad-leaf plants including alfalfa, potatoes, sunflowers, sugar beets, beans, tomatoes, other vegetable crops, fruit and ornamental trees. Spray in a manner which will minimize spray drift.

    Use of Straw from Treated Fields: Because of the persistence of picloram, do not use straw from treated crops for compost or mulching on susceptible broad-leaf crops. If straw is used for bedding or animal feed return the manure to fields to be planted to grain crops, flax or rapeseed.

    Succeeding crops: Do not plant susceptible broad-leaf crops such as sunflowers, beans, peas or potatoes the year following treatment. Fallow or replant to grain crops including wheat, barley, oats, flax and rapeseed. For more information on succeeding crops, contact manufacturer.

    Handling Treated Soils: Treated soil should not be moved to other areas, nor should it be used to grow susceptible broad-leaf plants unless an adequately sensitive bioassay or chemical test shows that no detectable picloram is present.

14. TOXICITY:

    - has very low acute mammalian toxicity
      oral LD_{50} rats = 2,460 mg/kg (Tordon 202C)
    - no short-term or long-term human health problems have been associated with Tordon when used according to label
    - non-toxic to fish and bees
    - may cause eye irritation
    - there is no dioxin in the 2,4-D of this formulation

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

15. PRECAUTIONS AND FIRST AID: Do not contaminate the skin and do not inhale the spray mist.

  - If on skin, wash off with soap and water.
  - If in eyes, wash for 15 minutes and get medical attention.
  - If swallowed, induce vomiting. Give plenty of water or milk to drink. Get medical attention.
  - Take labelled container to doctor.

16. STORAGE: Store Tordon 202C herbicide away from food, feedstuffs, fertilizers, seeds, insecticides, fungicides or any other pesticides and protect it from freezing. If freezing occurs, warm and mix thoroughly before using.

17. WHERE AVAILABLE: Oliver Agricultural Supply, Pfizer Chemical Dealers, Cargill Grain, United Grain Growers, Alberta Wheat Pool, Federated Co-operatives.

Additional information available from:

Dow Chemical Canada Inc.
Suite 2412, 10025 Jasper Avenue
Edmonton, Alberta
T5J 1S6
Phone Toll Free: 1-800-661-6436

TOTRIL (ioxynil)

1. FORMULATIONS: Emulsifiable concentrate 225 g/L
   Available in 4 L containers

2. REGISTERED MIXES: Totril + Compitox (turf only)

3. CROPS: Onions (seeded and transplanted), seedling turf.

4. WEED CONTROLLED: Lamb's-quarters, ragweed, redroot pigweed, lady's-thumb, common groundsel, mustard, wild radish, oak-leaved goosefoot, wild buckwheat, shepherd's-purse, chickweed, purslane, spurge, dandelion, stinking mayweed.

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED:

   - Seeded onions after plants have 3 fully developed true leaves.
   - Transplanted onions after they become established.
   - Turf after grass is 2.54 cm in height.

7. HOW TO APPLY:

   With: Ground equipment
   Rate: Onions: 0.809 L/ac **(2 L/ha)** Turf: 1.113-1.72 L/ac **(2.75-4.25 L/ha)** [At 1.113 L/ac **(2.75 L/ha)** rate, one 5 L container treats 4.41 ac (1.8 ha)
   Water Volume: 180 L/ac **(450 L/ha)**
   Pressure: 275 kPa
   Ground Speed: 9 km/h
   Nozzles: Any standard nozzle delivering 180 L/ac **(450 L/ha)**
   Protective Equipment: Standard protective clothing used when applying herbicides.
   - plus a face shield and apron when opening containers of Totril concentrate.

8. SPRAYING TIPS:

   (a) Do not spray in hot, humid weather conditions.
   (b) Spray when weeds are in seedling stage.

9. HOW IT WORKS: Totril is a contact type herbicide, therefore, good spray coverage of weeds is essential for control. Weeds are more sensitive at young stages of growth.

10. EXPECTED RESULTS: Depending on the weather, weeds should "crisp up" in 2 to 7 days after spraying.

    Crop: Scorch to older onion leaves may be noticed following treatment. Some injury in the form of leaf scorch, discolouration, stunting or distortion may occur if application is made in hot humid weather or under adverse conditions.

    Conditions under which poor results may be expected:
    1. Improper spray calibration.
    2. Use of less than 180 L/ac **(450 L/ha)** water.
    3. Weeds too far advanced.
    4. Spraying in hot, humid weather.

11. EFFECTS OF RAINFALL: No effect.

12. MOVEMENT IN SOIL: No movement.

13. GRAZING AND CROPPING RESTRICTIONS:

    Drift: Only broad-leaved crops could be affected. Danger from drift is low.
    Succeeding Crops: No restrictions.

14. TOXICITY:

    - has **very high** acute mammalian toxicity
      oral LD_{50} rats = 190 mg/kg
    - **symptoms of acute herbicide poisoning may appear in man shortly after using this product.**
    - no long-term human health problems are associated with this product when used according to label.

15. PRECAUTIONS AND FIRST AID: This product is very toxic and use all safety measures to avoid any kind of exposure.

    - If on skin, wash off **immediately** with soap and water.
    - If in eyes, wash for 15 minutes with clean water and get medical attention. Do not delay.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

- If swallowed, **do not induce vomiting.** Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Store in heated area.

17. WHERE AVAILABLE: Oliver Agricultural Supply.

Additional information available from:

May & Baker Canada Inc.
1865 Sargent Avenue
Bay #2
Winnipeg, Manitoba
R3H OE4
Phone: (204) 774-1819

TREFLAN (trifluralin)
(Cereals)

1. FORMULATIONS: Emulsifiable concentrate 545 g/L (Treflan 545 EC)
Available in 8.5 L containers.

2. REGISTERED MIXES: Treflan + Avadex
Treflan + Liquid Fertilizer
Treflan + Avadex + Liquid Fertilizer

Mix Restrictions: Add Treflan or Treflan + Avadex directly into the fluid fertilizer, mix thoroughly and apply as soon as possible. Constant agitation is required until application is complete.

3. CROPS: Barley and spring and durum wheat.

Underseeding: Not recommended.

4. WEEDS CONTROLLED: Green foxtail.

5. WEEDS SUPPRESSED: None

6. WHEN USED: Apply Treflan or Treflan + Avadex tank mix combination in the spring after planting and prior to emergence of wheat or barley.

7. HOW TO APPLY:

With: Ground Equipment
Rate: *Treflan 545 EC* – 0.445 L/ac **(1.1 L/ha)** on light to medium textured soil. 0.607 L/ac **(1.5 L/ha)** on heavy textured soil [One 8.5 L container treats 19.1 ac (7.7 ha) at the 0.445 L/ac **(1.1 L/ha)** rate].
Water Volume: 40 L/ac **(100 L/ha)**
Incorporation: Incorporate shallowly by two cross harrowings with tyne or diamond harrows operated at a speed of at least 8 km/h. Both incorporations should be done within 24 hours of application.
Pressure: Use low pressure.
Ground Speed: No restriction.
Nozzles: Standard and low pressure nozzles delivering 40 L/ac **(100 L/ha)**.
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of concentrated liquid.

8. SPRAYING TIPS:

(a) Application should be made only on fields that are trash free or summerfallow fields.
(b) Crop must be seeded prior to application of chemical and to a depth of 5-8 cm in a well tilled seedbed to prevent contact between the chemical and the seed.

9. HOW IT WORKS: Treflan acts on both the root and shoot tips as they emerge from the seed. Treflan is more active on the root tip than on the shoot tip. The chemical prevents cell division and affected plants die before emerging to the soil surface. If the shoot portion of the plant does escape to the soil surface, lateral or secondary root growth is inhibited causing a slow death since the plant is not able to actively gather moisture or nutrients.

10. EXPECTED RESULTS:

Green Foxtail: The majority of green foxtail seed is found within the top 3 cm of soil, which is treated with Treflan. These seeds are especially sensitive to Treflan and will die prior to emerging from the soil. Seeds that germinate from deeper in the soil will produce plants that do emerge. The secondary root system of these plants must form within 2 cm of the soil surface and is completely inhibited by Treflan present in that area. The affected plant then dies slowly as crop competition and temperature stress over-tax the rootless plant's ability to take up moisture.

Crop: The crop must be seeded prior to application of Treflan or Treflan + Avadex and must be seeded to a depth of 5-8 cm so that the seed does not come into contact with the Treflan layer. If this practice is followed no crop injury will result.

Conditions under which poor results may be expected:
1. Too low a rate for proper weed control.
2. Trash cover that prevents the proper incorporation of the chemical into the soil.
3. Improper incorporation, one incorporation or no incorporation.
4. Lumpy or wet soil that prevents proper incorporation of the chemical.

11. EFFECTS OF RAINFALL: Rainfall does not effect Treflan activity once incorporated into the soil.

12. MOVEMENT IN SOIL: Treflan is not leached in the soil.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

13. GRAZING AND CROPPING RESTRICTIONS:

Crop Use After Hail: No restrictions
Succeeding Crops: No restrictions

14. TOXICITY:

- has a very low acute mammalian toxicity
  oral LD_{50} rats = 10,000 mg/kg
- no short-term or long-term health problems are associated with this product when used according to label
- in clean water, fish are very sensitive to Treflan; but in runoff and muddy water, Treflan binds to the suspended soil particles and large amounts can be tolerated by fish
- non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Harmful if absorbed through the skin.
Avoid breathing spray mist.

- If on skin, wash with soap and water. Always wash all contaminated clothing before reuse.
- If in eyes, wash with plenty of clean water for 15 minutes and get medical attention.
- If swallowed, do not induce vomiting. Get medical attention immediately.
- Take labelled container to doctor.

16. STORAGE: Treflan 545 EC – Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near excessive heat, sparks or open flame.

17. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain, Pioneer Grain, Federated Co-operatives, Canbra Foods, Van Waters & Roger and most independant farm supply dealers.

Additional information available from:

Elanco
Division Eli Lilly Canada Inc.
Unit #3, 9829 – 44 Avenue
Edmonton, Alberta
T6E 5E6
Phone: (403) 436-7145

TREFLAN (trifluralin)
(Oilseeds, Special Crops, Vegetable Crops)

1. FORMULATIONS: Emulsifiable concentrate 545 g/L (Treflan 545 EC)
   Available in 8.5 L containers.
   5% Granular (Treflan QR5)
   Available in 25 kg bags.

2. REGISTERED MIXES: Treflan 545 EC + Liquid Nitrogen Fertilizer (28-0-0).

   Mix restrictions: Pour directly into liquid fertilizer, mix thoroughly and apply as soon as possible. Constant agitation is needed until application is complete.

   Mixing with other pesticides: Not recommended.

3. CROPS: Rapeseed, mustard, sunflowers, peas, soybeans, dry beans, lentils*, fababeans, flax*, crambe, snapbeans, lima beans, carrots, turnips, and transplants of tomatoes, peppers, broccoli, brussel sprouts, cabbage and cauliflower; direct seeded cabbage and cauliflower.

   * Fall application only.

   Underseeding: Not recommended.

4. WEEDS CONTROLLED: Annual bluegrass, barnyard grass, bromegrass, buckwheat (wild), chickweed, cow cockle, downy brome, foxtail (green and yellow), knotweed, lamb's-quarters, Persian darnel, pigweed, purslane, Russian thistle, wild oats.

5. WEEDS SUPPRESSED: None.

6. WHEN USED:

   - Spring application: cultivate to destroy existing weeds and apply prior to planting crop in the spring.
   - Fall application: apply in the fall (September 1st to freeze-up) prior to planting in the spring of the next year.

   NOTE – Since soil drifting may be encouraged by fall incorporation, this application technique should be discouraged in those areas where soil drifting is a problem.

   - Summer application: apply to summerfallow in the summer (June 1st to September 1st) prior to planting in the spring of the next year. Apply prior to emergence of weeds. Apply prior to seeding of crop.

7. HOW TO APPLY:

   With: Ground equipment
   Rate: *Spring Application*

   Treflan 545 EC
   (a) On all medium and heavy textured soils and on sandy soils with greater than 6% organic matter – apply 0.809 L/ac **(2.0 L/ha)**. [One 8.5 L jug treats 10.5 ac (4.25 ha) at the 0.809 L/ac **(2.0 L/ha)** rate.]
   (b) On medium and heavy textured soils with high organic matter content (6-15%) and with high wild oat infestations, apply 1.052 L/ac **(2.6 L/ha)**. [One 8.5 L jug treats 8.08 ac (3.27 ha) at the 1.052 L/ac **(2.6 L/ha)** rate.]
   (c) On sandy soils with less than 6% organic matter apply 0.607 L/ac **(1.5 L/ha)**. [One 8.5 L jug treats 14 ac (6.8 ha) at the 0.607 L/ac **(1.25 L/ha)** rate.]

   Fall Application – Between September 1st and Freeze-up
   Treflan 545 EC
   (a) On all medium and heavy textured soils and on sandy soils with greater than 6% organic matter – apply 1.052 ac (2.6 L/ha) [One 8.5 L jug treats 8.08 ac (3.27 ha) at the 1.052 L/ac **(2.6 L/ha)** rate.]
   (b) On medium and heavy textured soils with high organic matter content (6-15%) and with heavy wild oat infestations, apply 1.214 L/ac **(3.0 L/ha)**. [One 8.5 L jug treats 7 ac **(2.83 ha)** at the 1.214 L/ac **(3.0 L/ha)** rate.]
   (c) On sandy soils with less than 6% organic matter – apply 0.809 L/ac **(2.0 L/ha)**. [One 8.5 L jug treats 10.5 ac **(4.25 ha)** at the 0.809 L/ac **(2.0 L/ha)** rate.]

   Treflan QR5
   (a) On all medium and heavy textured soils and on sandy soils with greater than 6% organic matter – apply 11.3 kg/ac **(28 kg/ha)**. [One 25 kg bag treats 2.2 ac **(0.89 ha)** at the 11.3 kg/ac **(28 kg/ha)** rate.]
   (b) On medium and heavy textured soils with high organic matter content (6-15%) and with heavy wild oat infestations – apply 13.76 kg/ac **(34 kg/ha)**. [One 25 kg bag treats 1.8 ac (0.73 ha) at the 13.76 kg/ac **(34 kg/ha)** rate.]
   (c) On sandy soils with less than 6% organic matter – apply 8.9 kg/ac **(22 kg/ha)**. [One 25 kg bag treats 2.8 ac **(1.14 ha)** at the 8.9 kg/ac **rate (22 kg/ha)** rate.]

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Summer Application – Between June 1st and September 1st
Treflan 545 EC – 1.214 L/ac **(3 L/ha)** on all soils. [One 8.5 L jug will treat 7 ac **(2.83 ha)**]
Treflan QR5 – 13.35 kg/ac **(33 kg/ha)** on all soils. [One 25 kg bag treats 1.87 ac **(0.76 ha)**]

Special Instructions for Flax
Treflan 545 EC and Treflan QR5 cannot be spring applied for weed control in flax. Summer and fall application at the above rates are recommended for flax.

Water Volume: For Treflan 545 EC – 40 L/ac **(100 L/ha)**.

Incorporation: Incorporation must be done within 24 hours of application. Treflan 545 EC and Treflan QR5 must be thoroughly mixed into the top 8-10 cm of soil. A tandem disc, discer or field (vibra shank) type cultivator are recommended for incorporation. These implements should be set to cut 8-10 cm and incorporation should be done twice at cross angles with the implement set at the same depth. To get the best mixing action, operate the disc implement at 7-10 km/h and the cultivator at 10-13 km/h.

Special Instructions for Flax and Lentils
Spring application is not recommended. Both incorporations of Treflan 545 EC or QR5 must be done in the fall prior to seeding flax in the spring. The seedbed should be shallowly tilled in the spring and packed just prior to seeding to ensure a firm seedbed and accurate depth of planting. The remaining incorporation instructions for fall and summer application are as listed above.

Pressure: Use adequate pressure to get proper coverage. Low pressure is preferred in windy conditions.
Ground Speed: Not specified.
Nozzles: Nozzles that will apply 40 L/ac **(100 L/ha)** of spray at low pressure.
Protective Equipment: Standard protective clothing used when applying herbicides.
- plus a face shield and apron when opening containers of concentrated Treflan 545 EC.
- plus a respirator and goggles when opening bags of Treflan QR5 granules.

8. SPRAYING TIPS:

a) Do not apply Treflan or 545 EC to soils with more than 20-25% straw cover. When applying to stubble fields, chop and thoroughly mix residues into the soil prior to addition of Treflan EC.
b) Destroy all existing weed growth prior to application of Treflan EC.
c) Treflan QR5 can be used in conditions where trash is heavier but not so heavy as to limit incorporation.
d) Standing weed growth can exist when Treflan QR5 is applied, provided it does not interfere with distribution of the granule and does not limit incorporation. All existing weed growth must be killed by the incorporation procedures, since Treflan has no effect on established weeds.
e) Treflan QR5 will provide more effective weed control when the second incorporation is delayed for 3 days following first incorporation. This allows time for greater release of Treflan QR5 onto the soil particles and assures a more uniform distribution in the soil.
f) A tandem disc gives the best mixing action on stubble conditions.
g) Do not use a field cultivator to incorporate Treflan when the soil is crusted, lumpy or too wet for good mixing.
h) When fall application is used, it is preferred that both incorporations are completed in the fall.
i) When fall or summer application is used, work the soil lightly to 5-8 cm depth in the spring prior to seeding.
j) Do not apply Treflan on soils that are in poor working condition, wet soils or soils containing 15% or more organic matter.
k) On medium and heavy textured soils with high (6-15%) organic matter and heavy wild oat infestations; apply the maximum rates of Treflan 545 EC and QR5 for best results.
l) To avoid concentrating wild oat seeds below the treated layer, do not plow land prior to Treflan application.
m) Best performance from Treflan can be expected when the soil has good tilth and moisture when application and incorporation take place.

9. HOW IT WORKS: To work effectively, Treflan must be uniformly mixed throughout the soil in the zone of weed seed germination since it acts on the growing points of the root and shoot as they emerge from the seed. Treflan inhibits cell division and the actively growing points in the root and shoot. The effect on the roots is somewhat greater than the effect on the shoot.

The result of Treflan damage on weeds is death of the weed prior to emergence, since both root and shoot development are inhibited. If the shoot part of the weed escapes, it may show up as a puffy, slow growing shoot under the soil surface. This shoot is extremely brittle. The roots of affected plants show increased diameter near the tips and lateral and secondary root development is halted.

10. EXPECTED RESULTS:

The majority of susceptible weeds will be killed by Treflan before they ever reach the soil surface. In some cases the shoot part of the plant may appear at the soil surface and a leaf may develop. Further investigation will show that these weeds have no secondary root system and that existing roots are swollen and deformed. These weeds then die as temperature and crop competition increase because their reduced root systems are not capable of obtaining adequate moisture for growth.

Early spring observation of Treflan treated weeds prior to emergence will show a shoot that is growing slowly, puffy in appearance, deformed and very brittle to the touch.

Crop: Rapeseed, mustard, peas and sunflowers are extremely tolerant to Treflan at the normal rate. Flax must be seeded with special precautions. Seed flax into a well packed warm moist seedbed. Do not seed deeper than 4 cm.

Conditions under which poor results may be expected:

1. Rate of chemical applied is below recommended level.
2. Improper incorporation of the chemical, namely, single incorporation, use of improper equipment or incorporating too shallowly.
3. Incorporation on soils that are too wet, lumpy or trashy to allow for proper mixing.
4. Incorporation on clay or clay loam soils that are dry.

11. EFFECTS OF RAINFALL: Rainfall does not affect Treflan activity once incorporated into the soil.

12. MOVEMENT IN SOIL: Treflan is not leached in the soil.

13. GRAZING AND CROPPING RESTRICTIONS: None.

Crop Use After Hail: No restrictions
Succeeding Crops: Under normal conditions, Treflan carry over will not harm crops grown in rotation. As a precaution, oats, sugar beets and small seeded annual grasses such as timothy, canary seed and creeping red fescue should not be grown in rotation following a Treflan treated crop.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 10,000 mg/kg
- no short-term or long-term human health problems are associated with this product when used according to label
- in clean water, fish are very sensitive to Treflan; but in runoff and muddy water, Treflan binds to the suspended soil particles and large amounts can be tolerated by fish
- non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Harmful if absorbed through the skin.
Avoid breathing spray mist.

- If on skin, wash with soap and water. Always wash all contaminated clothing before reuse.
- If in eyes, wash with plenty of clean water for 15 minutes and get medical attention.
- If swallowed, do not induce vomiting. Get medical attention immediately.
- Take labelled container to doctor.

16. STORAGE:

Treflan 545 EC – Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.

17. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain, Pioneer Grain, Federated Co-operatives, Canbra Foods, Van Waters & Rogers, and most independent farm supply dealers.

Additional information available from:

Elanco
Division Eli Lilly Canada Inc.
Unit #3, 9829 – 44 Avenue
Edmonton, Alberta
T6E 5E6
Phone: (403) 436-7145

TROPOTOX (MCPB)

1. FORMULATIONS: Water soluble solution 400 g/L
   Available in 4 and 20 L containers

2. REGISTERED MIXES: None

3. CROPS: Peas

4. WEEDS CONTROLLED: Bull thistle, Canada thistle, curled dock, flixweed, field bindweed, hemp-nettle, lamb's-quarters, mustards (ball, wild and wormseed), plantain, ragweed, redroot pigweed, purslane, shepherd's-purse, smartweeds (annual), sow-thistle (annual), stinkweed, tall buttercup.

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Peas – 3-6 expanded leaves. Weeds – susceptible stage (see product label for specifics).

7. HOW TO APPLY:

With: Ground equipment
Rate: 1.416-1.72 L/ac **(3.5-4.25 L/ha)** depending on weeds to be controlled. [One 20 L container treats 14.12 ac **(5.7 ha)** at the 1.416 L/ac **(3.5 L/ha)** rate]
Water Volume: 60-80 L/ac **(150-200 L/ha)**
Pressure: 275 kPa
Ground Speed: 9 km/h
Nozzles: All standard nozzles delivering 60-80 L/ac **(150-200 L/ha)**.
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of Tropotox.

8. SPRAYING TIPS: Spray in warm weather when plants are growing well.

9. HOW IT WORKS: A systemic absorbed by leaves and stem translocated to actively growing regions of plant where it disrupts cell division, causes cell growth and interferes with respiration and food reserves. Some plants convert MCPB to MCPA quite efficiently, while others (peas) do not. This factor is the basis for selective use in certain legumes.

10. EXPECTED RESULTS:

Broad-leaved weeds: Should be dead within 2-3 weeks of treatment.

Conditions under which poor results may be expected:
1. Improper water volume.
2. Weeds too far advanced.

11. EFFECTS OF RAINFALL: Rainfall before the foliage has dried from the spraying may decrease activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: None listed

14. TOXICITY:

- has a slightly high acute toxicity to mammals
  oral LD_{50} rats = 500 mg/kg
- no short-term or long-term human health problems have been associated with this product when used according to label
- non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Avoid getting the product onto your skin or in your eyes.

- If on skin, wash off with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, induce vomiting. Give plenty of milk or water to drink. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Store in heated area.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

17. WHERE AVAILABLE: Alberta Wheat Pool, Pioneer Grain, Niagara Chemical Dealers, Cargill Grain, Oliver Agricultural Supply, Green Cross Product Dealers, Chipman Inc., King Agri-Serve.

Additional information available from:

May & Baker Canada Inc.
1865 Sargent Avenue
Bay #2
Winnipeg, Manitoba
R3H OE4
Phone: (204) 774-1819

TROPOTOX PLUS (MCPB + MCPA)

1. FORMULATIONS: Water soluble solution 375 g/L MCPB + 25 g/L MCPA
   Available in 20 L containers

2. REGISTERED MIXES: None

3. CROPS: Spring wheat, barley, oats, fall rye, seedling clover (wild white, Dutch white, Ladino, alsike and red), peas, pasture, field corn.

   Underseeding: For clover can be used on a cereal companion crop.

4. WEEDS CONTROLLED: Bull thistle, Canada thistle, curled dock, field bindweed, hemp-nettle, knotweed, lamb's-quarters, mustards (ball, wormseed and wild), purslane, ragweed, redroot pigweed, shepherd's-purse, smartweeds (annual), sow-thistle (annual), stinkweed, tall buttercup.

5. WEEDS SUPPRESSED: Not applicable.

6. WHEN USED:

   Cereals – 2 leaf to flag leaf stage
   Clover – after spade leaf stage to fourth true leaf stage
   Peas – 3-6 expanded leaves
   Pasture – after grazing or cutting
   Corn – 45 cm high but before beginning of tasseling, with drop nozzles.
   Weeds – susceptible stage (see product label for specifics)

7. HOW TO APPLY:

   With: Ground equipment
   Rate: 1.113-1.72 L/ac **(2.75-4.25 L/ha)** depending on weeds to be controlled [A 20 L container treats 17.9 ac **(7.3 ha)** at the 1.113 L/ac **(2.75 L/ha)** rate.].
   Water Volume: 60-80 L/ac **(150-200 L/ha)**
   Pressure: 275 kPa
   Ground Speed: 9 km/h
   Nozzles: All standard nozzles delivering 60-80 L/ac **(150-200 L/ha)**
   Protective Equipment: Standard protective clothing used when applying herbicides.
   – plus a face shield and apron when opening containers of this product.

8. SPRAYING TIPS: Spray in warm weather when plants are growing well.

9. HOW IT WORKS: A systemic absorbed by leaves and stems, translocated to actively growing regions, where it disrupts cell division, causes cell growth and interferes with respiration and food reserves. Some plants covert MCPB to MCPA quite efficiently, while others (clover) do not. This factor is the basis for selective use in certain legumes.

10. EXPECTED RESULTS:

    Broad-leaved weeds: Should be dead within 2-3 weeks of treatment.

    Conditions under which poor results may be expected:
    1. Improper water volume.
    2. Weeds too far advanced.

11. EFFECTS OF RAINFALL: Rainfall before the foliage has dried from the spraying may decrease activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: None listed.

14. TOXICITY:

    - has a slightly high acute toxicity to mammals
      oral LD_{50} rats = 500 mg/kg
    - no short-term or long-term human health problems have been associated with this product when used according to label
    - non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Avoid getting the product onto your skin or in your eyes.

    - If on skin, wash off with soap and water.
    - If in eyes, wash for 15 minutes with clean water and get medical attention.
    - If swallowed, induce vomiting. Give plenty of milk and water to drink. Get medical attention.
    - Take labelled container to doctor.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

16. STORAGE: Store in heated area.

17. WHERE AVAILABLE: Alberta Wheat Pool, Pioneer Grain, Niagara Chemical Dealers, Cargill Grain, Oliver Agricultural Supply, Green Cross Product Dealers, Chipman Inc., King Agri-Serve.

Additional information available from:

May & Baker Canada Inc.
1865 Sargent Avenue
Bay #2
Winnipeg, Manitoba
R3H 0E4
Phone: (204) 744-1819

UREABOR^R

1. FORMULATIONS: Sodium Chlorate – 30.0%
   Sodium Metaborate Tetrahydrate – 66.5%
   Bromacil – 1.5%

2. REGISTERED MIXES: None

   Mix Restrictions: Not applicable
   Mixing with other Pesticides: Not recommended

3. CROPS: Non-cropped land and industrial sites only.

4. WEEDS CONTROLLED: Ureabor^R is a non-selective weed killer designed to control perennial grasses and weeds. Weeds and grasses controlled include: asters, bouncing bet, buffalo bur, Canada thistle, cocklebur, daisies, dandelion, dogbane, dock, field bindweed, goldenrod, horsetail, kochia, ragweed, pigweeds, plantains, prickly lettuce, purslane, Russian thistle, sheep sorrel, shepherd's-purse, smartweeds, St. John's wort, spurges, sunflower, tumble mustard, yarrow, barnyard grass, blue grass, bluestems, cheat, downy brome, foxtail, goose grass, quack, wild oats, witch or tumble grass and many more.

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Ureabor^R may be used any time of the year. Best results are obtained when applied just prior to emergence or when weeds are young and succulent.

7. HOW TO APPLY:

With:	For dry applications use a spreader designed for application of dry materials. It is best to use a cyclone or crank type spreader for even application. For spray applications use equipment with mechanical agitation.
Rate:	0.5-1.5 kg/10m^2. Use lower rates when weeds are young and growing rapidly and higher rates for larger or more difficult to control weeds.
Water Volume:	5 L/10m^2 Incorporation: Not applicable
Pressure:	Not specified
Ground Speed:	Not specified
Nozzles:	Not specified
Protective Equipment:	Protective gloves and goggles are recommended.

8. SPRAYING TIPS:

   (a) Avoid contact with lawns, trees, shrubs and other desirable plants not intended to be destroyed. This includes treating areas underlaid by roots of adjacent valuable growths.
   (b) Thoroughly clean all application equipment after use.
   (c) When applying Ureabor^R as a spray application maintain constant agitation.
   (d) Do not apply where bare ground is undesirable.
   (e) Do not apply where soil erosion may be a problem.
   (f) Do not smoke or strike matches when applying.

9. HOW IT WORKS:

   Dry Application – Ureabor^R granules attach themselves to moist soil. Morning dew, light rainfall or sprinkling is required to get the material into the root zone. Once in the root zone, Ureabor^R is absorbed by the plant inhibiting photosynthesis, which causes the plant to turn brown. Smaller succulent weeds are affected first. Within days the foliage and root systems of weeds and grasses are dead.

   Spray Application – Where there is existing vegetation Ureabor^R is absorbed by the leaves of the plant and translocated toward the root system. This causes faster top kill. Both dry and spray application of Ureabor^R leave residual herbicide in the upper soil level to prevent future germination.

10. EXPECTED RESULTS: Vegetation present on treated ground will turn brown and die. No vegetation should be present after one growing season. No growth will reappear for several years depending upon application rate, soil type and environmental conditions.

    Conditions under which poor results may be expected:
    1. Application rate too low.
    2. Poor agitation when using a spray solution.
    3. Uneven application of granules.
    4. Too much, too little, rain.

11. EFFECTS OF RAINFALL: Rainfall activates Ureabor^R by carrying into the soil.

12. MOVEMENT IN SOIL: Ureabor^R moves vertically in the soil.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

13. GRAZING AND CROPPING RESTRICTIONS: Ureabor^R is designed for use only on industrial sites or non-cropped land.

14. TOXICITY: Bees – not applicable.

15. PRECAUTIONS AND FIRST AID: Harmful if swallowed. Avoid contact with skin, eyes and clothing. Keep animals off treated areas until rainfall has leached material into the soil.

    - If on skin, wash with soap and water. Get medical attention if irritation persists.
    - If in eyes, flush with water for 15 minutes. Get medical attention.
    - If swallowed, do not induce vomiting. Dilute by drinking water. Get medical attention.

16. STORAGE: Avoid contact with floor or moisture. Store on pallets or skids. Will absorb moisture.

17. WHERE AVAILABLE: MacKenzie & Feimann Limited.

Additional information available from:

MacKenzie & Feimann Ltd.
12835 – 146 Street
Edmonton, Alberta
T5L 2H6
Phone: (403) 451-9222

MacKenzie & Feimann Ltd.
3225 – 54 Avenue S.E.
Calgary, Alberta
T2C OA9
Phone: (403) 279-2791

VELPAR (hexazinone)

1. FORMULATIONS: A soluble powder containing 90% hexazinone
   Available in 25 kg containers

2. REGISTERED MIXES: None

3. CROPS: Non-crop land only. This is an industrial herbicide, used for total vegetation control.

4. WEEDS CONTROLLED:

   Group 1 – annual and perennial grasses, broad-leaved weeds such as: hemp-nettle, toadflax, horsetail, bouncing bet, Canada thistle, cypress spurge, wild carrot, common ragweed, burdock, mullein, wild raspberry, tansy ragwort, spreading dogbane and lamb's-quarters.
   Group 2 – bladder campion, ground ivy, golden rod, milkweed, poison ivy, bindweed, bedstraw, purple vetch, dandelion.
   Vines - wild grape, trumpet mix

5. WEEDS SUPPRESSED: Not applicable

6. WHEN USED: Apply Velpar just before or during the active growth period of weeds.

7. HOW TO APPLY:

With:	A fixed boom sprayer calibrated to apply a constant output at a constant speed. Handguns, back pack sprayers, tank type sprayers or a watering can may be used to treat smaller areas.
Rate:	For contact top growth or short term (3 month) control – apply 1.113-1.821 kg/ac **(2.75-4.5 kg/ha)** as a foliar spray. For longer (more than one season) control, apply 1.821-3.642 kg/ac **(4.5-9.0 kg/ha)** as a foliar spray. The higher rates of application should be used on fine textured soil (clay or clay loam) or on soils containing more than 5% organic matter.
Water Volume:	When applying with a handgun use a minimum of 650 L/ac **(1,600 L/ha)** of spray solution.
Incorporation:	Not applicable
Pressure:	Not restricted
Ground Speed:	Not restricted
Nozzles:	Not restricted
Protective Equipment:	Standard protective clothing used when applying herbicides. – plus a respirator and goggles when opening containers of Velpar powder.

8. SPRAYING TIPS:

   (a) Apply as a post-emergent spray while plants are actively growing.
   (b) Before spraying, calibrate the equipment to determine the quantity of water necessary to uniformly cover the measured area to be treated.
   (c) Weigh out the proper amount of Velpar and mix in the required quantity of water.
   (d) In making up a spray solution, up to 30 kg of Velpar will dissolve in 1,000 L of water with agitation. If greater concentrations are needed or cold water is used, then continuous agitation will be required.
   (e) Do not drain or flush equipment near desirable vegetation or trees or where it may come into contact with the roots of desirable trees or vegetation. A minimum safe interval is one and one half times the height of the tree away from the trunk.
   (f) Clean all traces of Velpar from the equipment before using it for any other purpose. Remove nozzle tips and screens and rinse thoroughly and flush the tank, pump, hoses and boom with several changes of water.

9. HOW IT WORKS: Velpar is a systemic herbicide which is readily absorbed through the roots and foliage of the plants and translocated upwards. The exact mechanism of action is not clearly understood but Velpar appears to be a photosynthesis inhibitor.

10. EXPECTED RESULTS: Susceptible plants become chlorotic soon after treatment and then die. Speed of action will be influenced by the rainfall.

    Conditions under which poor results may be expected:
    1. Inadequate application rate.
    2. Weed growth too mature.
    3. Insufficient rainfall.
    4. Application on areas subject to severe soil erosion.
    5. Application too near the feeding roots of susceptible vegetation.

11. EFFECTS OF RAINFALL: Rainfall closely following application of Velpar may affect the contact activity (top kill will not occur so quickly).

12. MOVEMENT IN SOIL: Velpar moves downward in the soil to the root zone of woody species.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: All crops and ornamentals may be injured by chemical drift. The extent of the injury is dependent upon the volume of chemical falling upon the desirable plants.
Grazing Restrictions: Not applicable
Crop Use After Hail: Not applicable
Succeeding Crops: Velpar is a non-selective residual herbicide. It should only be used on non-crop land where bare ground is desired.

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rats = 1,690 mg/kg
- no short-term or long-term human health problems are associated with Velpar when used according to label
- slightly toxic to fish
- may cause some eye irritation following use

15. PRECAUTIONS AND FIRST AID: Use a pair of goggles when spraying Velpar. Do not breathe spray mist. Do not get on skin.

- If on skin, wash off immediately. Wash contaminated clothing.
- If in eyes, wash for 15 minutes. Get medical attention.
- Do not apply Velpar to frozen ground.
- Do not use on lawns, driveways, tennis courts or similar areas.

16. STORAGE: Store in a cool, dry place.

17. WHERE AVAILABLE: Able Industries, Ace Vegetation Control, Molsberry-Division of Reichhold Chemical, Midland Vegetation Control Inc.

Additional information available from:

DuPont Canada Inc.
#105, 333 – 25 Street E.
Saskatoon, Saskatchewan
S7K OL4
Phone: (306) 244-4511

WYPOUT (barban)

1. FORMULATIONS: Emulsifiable concentrate 120 g/L (Wypout)
Emulsifiable concentrate 240 g/L (Wypout 250)
Both available in 20 L containers.

2. REGISTERED MIXES: None

Mixing with other pesticides: Not recommended

3. CROPS: Spring wheat*, durum wheat, barley, lentils, rapeseed, mustard, fababeans, sugar beets, sunflowers, flax, peas, alfalfa, sweet clover, red clover, alsike clover*, smooth bromegrass, Russian wild ryegrass, timothy, creeping red fescue, crested wheatgrass.

* Do not use Wypout 250 on alsike clover, or Park Wheat.

Underseeding: Any combination of the above.

4. WEEDS CONTROLLED: Wild oats

5. WEEDS SUPPRESSED: None

6. WHEN USED: When the majority of the wild oats are in the 2 leaf stage and the crop in the proper stage of growth (refer to label). Crop injury may occur if sprayed earlier or later than recommended.

7. HOW TO APPLY:

With: Aircraft or ground equipment
Rate: Wypout: 0.911-1.416 L/ac **(2.25-3.5 L/ha)** Wypout 250: 0.405-0.708 L/ac **(1.0-1.75 L/ha)** Use only the 0.405 (1.0 L/ha) rate on wheat. Check label for specific rate for crop
Water Volume: Ground equipment – 16-40 L/ac **(40-100 L/ha)**
Incorporation: Not applicable
Pressure: 350 kPa; Spray Coupe with special nozzles to 512 kPa
Ground Speed: 8 km/h; Spray Coupe with special nozzles to 13 km/h
Nozzles: Monarch 20 and 22; Spray-jet 65-067; Teejet 650067, 730077 and 800067 for regular sprayers. Teejet 730116 and 73154*; LF 1.16-73 and 1.54-73* for Spray Coupes. * Use only at 512 kPa and 13 km/h
Protective Equipment: Standard protective clothing used when applying herbicides.
– plus a face shield and apron when opening containers of Wypout emulsifiable concentrate (E.C.)

8. SPRAYING TIPS:

(a) Nozzles should be tilted 45° forward.
(b) Do not spray when plants are wet with dew or rain.
(c) Rain within 15 minutes of spraying will not affect performance.
(d) Crop damage may occur if sprayed within 24 hours of frost.
(e) Do not add additional surfactants or wetting agents to spray solution.

9. HOW IT WORKS: Wypout and Wypout 250 are systemic herbicides which are absorbed by the plant at the ligule (collar region) and the area just above the shoot or coleoptile. They stop cell elongation and cell division as well as interfering with translocation of sugar to new tissue within the plant. Crop competition is necessary to provide control of wild oats.

10. EXPECTED RESULTS:

Wild oats: Any wild oats past the 2 leaf stage may not be controlled. Wild oats which emerge after spraying will not be controlled. Affected plants will turn blue-green and remain stunted throughout the growing season.

Crop: No effect noted on crop. With Wypout 250 on wheat, a temporary blue-green effect on the plant may be noticed. Wypout 250 should not be used on Park Wheat.

11. EFFECTS OF RAINFALL: Rain 15 minutes after spraying will not effect wild oat control.

12. MOVEMENT IN SOIL: Not applicable

13. GRAZING AND CROPPING RESTRICTIONS:

Drift: Do not allow spray to drift onto adjacent fields, particularly if planted to oats, rye or buckwheat.
Grazing Restrictions: Do not graze or feed crop until 5 weeks after treatment.
Crop Use After Hail: Do not use for five weeks after treatment.
Succeeding Crops: No restrictions.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

14. TOXICITY:

- has very low acute mammalian toxicity
  oral LD_{50} rat = 1,350 mg/kg
- **contains barban which may cause skin sensitization to some people**
- non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Avoid getting this product on your skin and do not inhale spray mist. May cause skin sensitization. Keep skin covered as much as possible. Wash working clothes following each day of pesticide application.

- If on skin, wash off **immediately** with soap and water.
- If in eyes, wash for 15 minutes and get medical attention.
- If swallowed, **do not induce vomiting**. Get medical attention.
- Take labelled container to doctor.

16. STORAGE: Store in heated area. Product may crystallize if stored below 0°C. To reconstitute, warm to +10°C and agitate well.

17. WHERE AVAILABLE: Uniroyal Chemical

Additional information available from:

Uniroyal Chemical
4 – 1323 – 44th Avenue N.E.
Calgary, Alberta
T2E 6L5
Phone: (403) 276-9481

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CHEMICAL INSECT CONTROL IN ALBERTA

Introduction

Insect pests are present on most crops in Alberta. The degree of infestation and the severity of damage vary drastically from area to area and season to season.

Some pests, such as grasshoppers and bertha armyworm, are sporadic and require occasional control during periods of abundance which may last from one to three years. Other pests are perennial; sugar beet root maggot, for example, is controlled by the application of a granular insecticide at planting.

To insure proper use of insecticides identify the pest, learn its biology, monitor your fields and don't panic when you see an insect in your crop. Keep in touch with extension personnel to obtain information on pending pest problems and keep in mind the previous years' problems so you are prepared for changes in insect population levels.

Chemical Control

Attention to the following points should lead to more effective control. Insecticides will kill the pest insect if applied properly at a stage when the pest is susceptible. An application that is made too early or too late in the life cycle may not provide adequate control and would be an unnecessary expense. Follow the label instructions for proper application and obtain information from agricultural extension personnel on the biology of the pest. Base control decisions on plant canopy, weather conditions, age/or size of the insect and dosage required. Most insecticides have limited residual control properties when applied to foliage; if insects are moving into crops or emerging over an extended period, several applications in the same season may be necessary.

Safety

In general, insecticides are more toxic to humans, wildlife, fish, bees and other non-target organisms than herbicides. Follow label directions exactly for safety precautions associated with application of each insecticide. Refer to pages 3-7 in the front of this manual for general information on pesticide toxicity, exposure, safety precautions, protective equipment, symptoms, first aid, poison control centres, and disposal. More information on safety is included with each insecticide write-up in this section.

Bee Safety

Honey bees and other pollinators are susceptible to most insecticides. If applications must be made to crops in bloom or to areas containing weed or volunteer crops in bloom, severe pollinator mortality may occur. To reduce the risk to pollinators, apply insecticides in the late evening (most preferred) or early morning when bees are not flying. Advise beekeepers in the area of pending insecticide applications at least 48 hours before application so they can protect their bees. Never allow insecticide spray to drift directly onto an apiary site. Do not apply insecticides to temporary or permanent water bodies which may be used by bees.

Livestock and Residues

All insecticide labels provide a wait period between application and harvest, feeding to livestock, or grazing if applied to a forage. These restrictions must be followed to prevent illegal residues and eliminate hazards to the end user of the crop. Follow the label instructions to insure that a crop intended for forage or grazing is treated with the proper insecticide and is safe for livestock consumption.

The Manual

This manual includes only the major insecticides registered for use in Alberta. Additionally, not all insect pests controlled are listed for each pesticide; see the labels for complete listings. Always observe the label restrictions.

For additional information on insecticide recommendation and insect control, contact your local Alberta Agriculture extension office.

AMBUSH, POUNCE (permethrin)

1. FORMULATIONS: Emulsifiable concentrates –
   Ambush (500 g permethrin/L)
   Pounce (384 g permethrin/L)

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Permethrin is a synthetic pyrethroid insecticide which works by contact on a wide range of pests. Good residual activity. No systemic or fumigant activity.

4. NUMBER OF APPLICATIONS: Repeat as necessary.

5. HOW TO APPLY:

With: Ground equipment only.

Rate:

Crop	**Insect**	**Formulation**	ml/ac	**(ml/ha)**
Cereals (barley, corn, oats, rye, wheat), Oilseeds (canola, mustard, sunflower), Sugar beets, Sweet corn(1)	Cutworms (army, pale western, red-backed)	Ambush	55 90-120 +	**(140)** **(225-300) +**
Corn, sweet(1)	Corn earworm,	Ambush or	80-110	**(200-275)**
	European corn borer	Pounce	110-150	**(275-375)**
Potato (55)	Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug	Ambush	55-80	**(140-200)**

Notes: 1. **Pre-harvest interval** (days) given in brackets after crop.
2. **Rate range** – use the high rate for heavy infestations (anticipated or actual), or when adult insects are present, or when foliage is dense, or (for cutworms) when soil is dry +.

Water Volume: Corn applications, use:
with Ambush 130-180 L/ac **(325-450 L/ha)**
with Pounce 140-180 L/ac **(350-450 L/ha)**
Potato application, use sufficient water to obtain thorough coverage of foliage.

Protective Equipment: Wear protective clothing including rubber gloves and goggles when handling concentrate.

6. SPRAYING TIPS: Corn – spray not later than when first feeding damage is seen on foliage. For control of corn earworm, direct spray to ensure coverage of ears and silk. For European corn borer control, consult with provincial agriculturalist for proper timing of spray.

7. GRAZING AND CROPPING RESTRICTIONS: Do not feed any crop treated with permethrin to livestock.

8. TOXICITY: Acute oral LD_{50} = 430 – 4000 mg/kg (rat)

9. SAFETY:

Toxicological information (for the physician): Treatment of systemic intoxication should be primarily symptomatic and supportive. In cases of ingestion, carry out gastric lavage with care to prevent aspiration.

First aid:
IF SWALLOWED – DO NOT induce vomiting or administer liquids; product contains petroleum distillates. Go immediately to nearest physician.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

IF IN EYES – flush with water for at least 15 minutes. Get medical attention.

IF ON SKIN – remove contaminated clothing at once. Wash with soap and water.

10. PRECAUTIONS:

- KEEP OUT OF REACH OF CHILDREN. Severe eye irritant. Avoid contact with eyes, skin or mouth. Avoid breathing spray mist. Wash thoroughly with soap after using and before eating or smoking. Keep in original container during storage. Do not contaminate food or feed. Keep product away from fire, open flame, lighted electric bulbs and other sources of heat. Toxic to fish; do not apply where streams, lakes, ponds or water may be contaminated. Toxic to bees and other beneficial insects. Do not spray when bees are foraging.

11. STORAGE: Do not store in or around the home, or near food or feed.

12. DECONTAMINATION AND DISPOSAL: Rinse empty bottle 3 times with clean water, each time disposing of rinse in the spray tank. Break rinsed bottle and cap and dispose of in garbage.

13. WHERE AVAILABLE: Alberta Wheat Pool, United Grain Growers, Pioneer Grain, Green Cross Product Dealers, Oliver Agricultural Supply, Pfizer Chemical Dealers and most pesticide suppliers.

Additional information available from:

Chemagro Limited
1355 Aerowood Drive
Mississauga, Ontario
L4W 1C2
Phone: (416) 625-5280

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421

BELMARK (fenvalerate)

1. FORMULATIONS: Emulsifiable concentrate (300 g fenvalerate/L)
2. MARKETING CATEGORY: Commercial
3. REGISTERED MIXES: None specified. Product is compatible with most commonly used fungicides and insecticides.
4. HOW IT WORKS: Fenvalerate is a non-systemic, synthetic pyrethroid insecticide which controls primarily by contact action and ingestion. It adheres to the leaf cuticle; insects can receive a lethal dose by chewing on the leaf. Product may not provide a quick kill of all insects. Those not killed immediately are normally sluggish, disorientated and do not feed. Stability in sunlight and resistance to rain wash-off ensure good residual activity.
5. NUMBER OF APPLICATIONS: Repeat as necessary.
6. HOW TO APPLY:

With: Ground equipment only.

Rate:

Crop	**Insect**	ml/ac	**(ml/ha)**
Potato (7)	Colorado potato beetle, flea beetle, leaf hopper, tarnished plant bug	40-60	**(100-150)**
	Aphids	90-130	**(225-325)**

Notes: 1. **Pre-harvest interval** is 7 days.
2. Use the low rate for light infestations.

Water Volume: For aphids, use 180-225 L/ac **(450-550 L/ha)**. For other pests, use 90-200 L/ac **(225-500 L/ha)**.

Pressure: For aphids, 1400-2800 kPa (cone nozzles).

Protective Equipment: Wear neoprene or PVC gloves, cotton overalls and rubber boots when opening containers, mixing concentrate and filling tank.

7. SPRAYING TIPS: Since only a small quantity of product is involved, ensure that mixing is thorough. Add the product to the spray tank as the water is being pumped in. Good spray coverage is essential. Spray when insects or feeding damage first appears.
8. TOXICITY: Acute oral LD_{50} = 427 mg/kg (rat)
9. SAFETY:

Symptoms of poisoning: No cases of poisoning in man have been reported. Formulation may be irritating to the skin, eyes, nose and throat. When in contact with the skin, it may cause a sensitization described as a tingling feeling, but no other side effects will be felt.

Toxicological information (for the physician): The treatment of systemic intoxication should be primarily symptomatic and supportive. In cases of ingestion, carry out gastric lavage with care to prevent aspiration.

First aid: IF SWALLOWED, DO NOT induce vomiting or administer liquids. Keep prone and quiet. Transport immediately to nearest physician. IF IN EYES, flush immediately with water and continue for 15 minutes. IF ON SKIN, wash with soap and water.

10. PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN. When opening containers, or working with concentrate, wear protective, neoprene or PVC gloves, cotton overalls and rubber boots. Avoid exposure to spray mist. Do not contaminate ponds, waterways or water supply. Product is highly toxic to bees. Do not spray when crop is in bloom or when bees are foraging.
11. STORAGE: Do not use or store near heat or open flame. Do not store near food or feed. Do not store in or around the home.
12. DECONTAMINATION AND DISPOSAL: Rinse empty bottle 3 times with fresh water, disposing of rinses in the spray tank. Break rinsed bottle and cap and dispose into the garbage.

13. WHERE AVAILABLE: Green Cross Products Dealers, Alberta Wheat Pool, United Grain Growers, Pioneer Grain, Pfizer Chemical Dealers, Federated Co-operatives.

Additional information available from:

Ciba-Geigy Canada Ltd.
6860 Century Avenue
Mississauga, Ontario
L5N 2W5
Phone: (416) 836-9445

Green Cross Products
820 – 26 Street N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

COUNTER (terbufos)

1. FORMULATIONS: Granules – Counter 5-G (5% terbufos)
   – Counter 15-G (15% terbufos)

2. MARKETING CATEGORY: Restricted (products to be stored or displayed apart from food or feed).

3. REGISTERED MIXES: 5G may be mixed with fungicide treated seed.

4. HOW IT WORKS: Terbufos is a systemic, organophosphorus insecticide with effective initial and residual activity against soil insects and other arthropods.

5. NUMBER OF APPLICATIONS: One, applied in furrow with the seed.

6. HOW TO APPLY:

With: Ground equipment.

Rate:

Crop	Insect	Formulation	kg/ac	(kg/ha)
Canola, mustard	Flea beetle	5-G	2.2-4.45	(5.5-11.0)
Sugar beet	Sugar beet root maggot, wireworm	45 g 15-G/100 m row minimum 50 cm row spacing		

Note: If extreme infestations are anticipated use the high rate.

Incorporation: Canola and mustard – carefully blend seed and granules together using a mechanical mixer or stirring with a stick in the drill box. Adjust the flow rate, which may be slightly slower than seed alone, to sow combined weight of seed and granules.
Sugar beets – apply in furrow, 5-8 cm behind the seed drop zone after some soil has covered the seed.

Protective Equipment: Protective clothing and respirator. Rubber gloves while handling product or treated seed.

7. APPLICATION TIPS: Do not apply later than at planting time. Do not place 15-G granules in direct contact with seed. When a seed treatment is also used – mix the seed treatment with seed, then mix granules with treated seed.

8. GRAZING RESTRICTIONS: Sugar beet tops and beet pulp may be fed to livestock after harvest.

9. TOXICITY: Acute oral LD_{50} = 1.6 mg/kg (rat)

10. SAFETY:

Symptoms of poisoning may include: weakness, headache, tightness of chest, blurred vision, non-reactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea and abdominal cramps.

Toxicological information (for the physician): Give atropine intramuscularly or intravenously depending on severity of poisoning, 2-4 milligrams (3-6 tablets of 0.65 mg each) every 10 minutes until fully atropinized as shown by dilated pupils, dry flushed skin and tachycardia. Twenty or thirty milligrams, or more may be required during the first 24 hours. Never give opiates or phenothiazine tranquilizers. Clear chest by postural drainage. Artificial respiration or oxygen administration may be necessary. Observe patient continuously for at least 48 hours. Repeated exposure to cholinesterase inhibitors may, without warning, cause increased susceptibility to very small doses of any cholinesterase inhibitor. Allow no further exposure to any cholinesterase inhibitor until cholinesterase regeneration has taken place as determined by blood tests. Pralidoxime chloride (2-PAM: PROTOPAM chloride) may be effective as an adjunct to atropine. Use according to label directions.

First aid: IN CASE OF EMERGENCY endangering life or property involving these products, call collect, day or night, 1-416-356-8310.

ATROPINE IS AN ANTIDOTE. Consult your physician about obtaining a supply of 0.65 milligram tablets for emergency use. If symptoms include blurred vision, stomach cramps or tightness in chest, don't wait for a physician but take two tablets at once. Do not take atropine unless symptoms of poisoning have occurred. Anyone who has been sick enough to have taken atropine must be seen by a physician as soon as possible.

CALL A PHYSICIAN AT ONCE IN ALL CASES OF SUSPECTED POISONING

IF SWALLOWED – drink one or two glasses of water and induce vomiting by touching back of throat with finger. **Do not induce vomiting or give anything by mouth to an unconscious person.** Get medical attention.

IF INHALED – remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen.

IF IN EYES – immediately flush eyes or skin with plenty of water for at least 15 minutes. Get medical attention.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

IF ON SKIN – immediately remove contaminated clothing and wash skin thoroughly with soap and water. Launder clothing before re-use. Wash thoroughly with soap and water before eating, drinking or smoking. Bathe at the end of the work day, and change outer clothing.

11. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Poisonous by skin contact, inhalation or swallowing. Rapidly absorbed through skin. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning.

DO NOT GET IN EYES, ON SKIN OR CLOTHING – Wear freshly laundered, long-sleeved work clothing daily. While transferring from package to equipment, wear a clean cap and gloves (rubber or cotton). If cotton gloves are used, they must be laundered or discarded after each day's use. Rubber gloves should be washed with soap and water after each use. Do not wear the same gloves for other work. Destroy and replace gloves frequently.

DO NOT BREATHE DUST – While emptying bags into equipment, pour downwind and allow as little free fall as possible. Do not pour at face level and do not allow dust to reach the breathing zone.

DO NOT CONTAMINATE FOOD OR FEED PRODUCTS.

Sweep up and bury spillage whether it occurs indoors or in the field. Once a bag has been opened, use it completely or bury the remainder. Make sure that the hoppers of equipment are emptied while still in the field. Cover granules that may be exposed on the ends of the treated rows, turns and field loading areas.

Keep all unprotected persons out of the operating areas. Keep out of reach of domestic animals. Not for use in or around the home.
Highly toxic to fish, birds and other wildlife. Do not contaminate any body of water nor apply to any area not specified on the label.

12. STORAGE: Do not store in or around the home. Store apart from food or feed.

13. DECONTAMINATION: Decontamination Solution – Into 10 L of water **slowly and carefully add in sequence** 130 g detergent followed by 525 g caustic soda (lye) and finally 1.2 litres of commercial bleach (sodium hypochlorite). **Handle and use the solution with great care. Do not add water to dry lye.**

14. DISPOSAL:

Dispose of empty bags by delivering them to an approved landfill site for burial. DO NOT BURN.

If spill occurs on floor areas use a sweeping compound to clean up. Decontaminate the waste with decontamination solution. Wash floor with decontamination solution and rinse well with clean water. Clean up solution and rinse water with absorbent materials such as sawdust, sweeping compound, rags, etc. Dispose of waste and rinsings by burying in a non-crop, non-graze area away from all water supplies.

If spill occurs on the ground collect the material and dispose of it as above. Treat affected area with decontamination solution and cover with clean soil.

Wear the protective clothing described above during product decontamination and disposal operations.

13. WHERE AVAILABLE: Pfizer Chemical Dealers, United Grain Growers.

Additional information available from:

Cyanamid of Canada Ltd.
7121 H – 6 Street S.E.
Calgary, Alberta
T2H 2M8
Phone: (403) 253-0924

CYGON (dimethoate)

1. FORMULATIONS: Emulsifiable concentrates –
   Cygon 480E, Cygon 4-E and Cygon Hopper-Kill
   (480 g dimethoate/L)
2. MARKETING CATEGORY: Commercial
3. HOW IT WORKS: Dimethoate is a broad-spectrum, systemic and contact, organophosphate insecticide and acaricide. Non-phytotoxic at recommended rates.
4. NUMBER OF APPLICATIONS: Repeat only when necessary.
5. HOW TO APPLY:

With: Ground or air equipment.

Rate:

Crop	Insect	mL/ac	(mL/ha)
Cereals: barley, oats, wheat	Grasshoppers, thrips	220-405	**(550-1000)**
Forages: alfalfa, clovers; pastures, waste areas	Aphids, young grasshoppers, leafhoppers, lygus bugs, plant bugs, alfalfa weevil larvae	170	**(425)**
	Adult (winged) grasshoppers	345-405	**(850-1000)**
Sweet clover	Weevil	345-445	**(850-1100)**
Canola	Aphids, leafhoppers, grasshoppers	345-365	**(850-900)**
Potato (7)	Aphids, leafhoppers	25-445	**(550-1100)**

Notes: 1. **Pre-harvest interval** is dependent upon the rate applied. When using 170-225 mL/ac **(425-550 mL/ha)**, do not harvest or graze within 2 days. When using 345-365 mL/ac **(850-900 mL/ha)**, do not harvest or graze forages within 7 days, or canola and grains within 21 days. When using 365-445 mL/ac **(900-1100 mL/ha)**, do not harvest or graze within 28 days. Do not harvest potatoes within 7 days.

2. Grasshopper and sweet clover weevil control – when a range of rates is given, use the low rate for young insects, minor infestations or sparse foliage. Use the high rate for adult insects (winged grasshoppers and beetles), severe infestations or dense foliage.

Water Volume: Use 18 L/ac **(45 L/ha)** for good coverage.
Potatoes – a minimum of 81 L/ac **(200 L/ha)**.

Protective Equipment: Wear a respirator when exposure to spray cannot be avoided; wear goggles, rubber gloves and coveralls when handling concentrate.

6. SPRAYING TIPS: Apply when insects or damage first appears. Not suitable for application in oil.
7. GRAZING AND CROPPING RESTRICTIONS: Remove cattle prior to spraying. Pre-harvest intervals and grazing – wait periods are dependent on rate applied – see "How to Apply".
8. TOXICITY: Acute oral LD_{50} = 320-380 mg/kg (rat)
9. SAFETY:

Symptoms of poisoning may include: nausea, vomiting, pinpoint pupils, excessive salivation, muscle twitching, convulsions and coma. This product, upon repeated or prolonged use, may cause cholinesterase inhibition.

Toxicological information (for the physician):
Atropine is antidotal: give 1-2 mg of atropine sulphate intramuscularly or intravenously immediately and every 15-30 minutes until full atropinization has been attained. Pralidoxime chloride (2-PAM: PROTOPAM chloride) may be effective as an adjunct to atropine. Use according to label directions.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

First aid: Call a physician at once in all cases of suspected poisoning.

IF ON SKIN, wash thoroughly with soap and water.
IF IN EYES, flush eyes with plenty of water for 15 minutes; seek medical attention.
IF SWALLOWED, drink one or two glasses of water and induce vomiting by touching back of throat with finger. **Do not induce vomiting or give anything by mouth to an unconscious person.** Get medical attention.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. May be harmful or fatal if swallowed, inhaled or absorbed through the skin. Concentrate material may cause eye irritation. Avoid breathing vapours or spray mist. Use only in adequately ventilated areas. Avoid contact with skin, eyes or clothing. Wash thoroughly after using and before eating, drinking or smoking.

Do not contaminate food or feeds. Do not use, pour, spill or store near heat or open flame. Highly toxic to birds, bees and other wildlife. Do not treat when bees are foraging.

11. STORAGE: Store between 5°C and 30°C, away from feed and food.

12. DECONTAMINATION AND DISPOSAL: If accidental spillage should occur, scrub contaminated area immediately with a strong laundry soap solution or use household lye – detergents are not satisfactory for this purpose. Repeated scrubbings are necessary on plain wood surfaces.

Drain the container completely into the spray tank. Then rinse the container at least 3 times, filling at least one-quarter full with water each time and draining into the spray tank after each rinse. Crush or break the empty container and bury it with at least 0.5 m of cover and away from water supplies.

13. WHERE AVAILABLE: From most grain companies and many independent farm supply and chemical dealers.

Additional information available from:

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421

Cyanamid of Canada Ltd.
7121 H – 6 Street S.E.
Calgary, Alberta
T2H 2M8
Phone: (403) 253-0924

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

DECIS (deltamethrin)

1. FORMULATIONS: Emulsifiable concentrate – Decis 5 EC (50 g/L).

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Deltamethrin is a non-systemic, synthetic pyrethroid which works by contact and ingestion on the nervous system.

4. NUMBER OF APPLICATIONS: One per year (grasshoppers); maximum of three per year (Colorado potato beetle); repeat as necessary (flea beetles).

5. HOW TO APPLY:

With: Ground equipment only.

Rate:

Crop	**Insect**	mL/ac	**(mL/ha)**
Canola (14) mustard (14)	Flea beetle	40-60	**(100-150)**
Potato (23)	Colorado potato beetle	40-60	**(100-150)**
Wheat (50) barley (50)	Grasshoppers	40-60	**(100-150)**

Notes: 1. **Pre-harvest interval** (days) given in brackets after crop.
2. Use high rate for severe infestation, on dense foliage, or when adult insects are present.

Water Volume: flea beetles – 40 L/ac **(100 L/ha)**; potato beetle – 80-200 L/ac **(200-500 L/ha)**; grasshoppers – 40-80 L/ac **(100-200 L/ha)**.

Pressure: 275 kPa

Protective Equipment: Wear protective clothing including goggles and respirator when handling or spraying. Product is a severe eye and skin irritant.

6. SPRAYING TIPS: Do not spray under a strong temperature inversion, or when temperature exceeds 25°C. Do not mix product with any other chemicals, additives or fertilizers. With severe flea beetle and grasshopper infestations, spray fence rows and a 15-meter strip into adjacent summerfallow and cropped fields. Apply to young (non-flying) grasshoppers for best results. Apply when insects or damage first appears. Do not spray when bees are foraging.

7. GRAZING AND CROPPING RESTRICTIONS: Do not graze treated fields.
Do not feed treated crops to livestock, including crops damaged by hail.

8. TOXICITY: Acute oral LD_{50} is 67 mg/kg (rat)

9. SAFETY:

Symptoms of poisoning: neurological dysfunction, such as convulsions, with severe poisoning.

Toxicological information (for the physician): Product contains xylene (petroleum distillate).

IF INGESTED – DO NOT induce vomiting or administer liquids. A gastric lavage should be done, with care to prevent aspiration, followed by administration of activated charcoal or ATTAPULGITE.

IF INHALED – administer a cysteine derivative aerosol for 15 minutes.

Treat severe poisoning (neurological symptoms and convulsions) with amobarbitol.

Keep patient warm, prone and quiet.

First aid: Call a physician immediately. IF ON SKIN, wash with soap and water; treat irritated area with a Nivea-type cream. IF IN EYES, flush with water for 15 minutes.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Avoid contact with eyes, clothing and skin – product is a severe eye and skin irritant. Wear protective clothing, goggles and respirator when handling or spraying. Toxic to fish and other aquatic organisms. Toxic to bees. Keep away from fire, open flame and other sources of heat. Do not contaminate water supply.

11. STORAGE: Do not store below freezing. Do not store near feed or food.

12. DISPOSAL: Rinse empty containers with clean water at least three times, each time adding rinse water to spray tank. Crush rinsed containers and either bury at least 45 cm deep in loamy soil in a non-crop, non-graze area away from all water supplies or deliver to an approved land fill.

13. WHERE AVAILABLE: Alberta Wheat Pool, Federated Co-op Ltd., Cargill Grain, Pioneer Grain, United Grain Growers Ltd., Oliver Agricultural Supply, Pfizer Chemical Dealers, Niagara Chemicals.

Additional information available from:

Hoechst Canada Inc.
109, 2915 – 21 Street N.E.
Calgary, Alberta
T2E 6Z1
Phone: (403) 230-2294

Hoechst Canada Inc.
295 Henderson Drive
Regina, Saskatchewan
S4N 6C2
Phone: (306) 924-1500

DIAZINON (diazinon)

1. FORMULATIONS: Wettable powder (WP) – Diazinon 50W (50% diazinon).
   Emulsifiable concentrate (EC) – Diazinon 500 (500 g diazinon/L).

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES: When using WP as a seed treatment for corn and sugarbeets, mix with a fungicide (75% Captan or 75% Thiram).

4. HOW IT WORKS: Diazinon is a non-systemic, organophosphate insecticide which works by contact and ingestion. Diazinon deteriorates rapidly in solution and in containers once opened.

5. NUMBER OF APPLICATIONS: Repeat as necessary.

6. HOW TO APPLY:

With: Ground equipment.

Rate:

Crop	Insect	Formulation	Qty/ac	(Qty/ha)
Potato (14)	Aphids, Colorado potato beetle, flea beetles, leafminers, leafhoppers	WP	0.45 kg	(1.1 kg)
		or		
		EC	0.45 L	(1.1 L)

Note: **Pre-harvest interval** (days) given in brackets after crop.

Water Volume: Use sufficient spray volume for thorough coverage.

Protective Equipment: Wear a pesticide respirator when spray mist or dust cannot be avoided. Wear rubber gloves when handling treated seed.

7. APPLICATION TIPS: Spray when insects first appear.

8. TOXICITY: Acute oral LD_{50} is 250 mg/kg (rat)

9. SAFETY:

Symptoms of poisoning may induce: headaches, giddiness, blurred vision, nervousness, weakness, nausea, cramps, diarrhea, discomfort in the chest, sweating, pinpoint pupils, tearing, salivation and other excessive respiratory tract secretion, vomiting, cyanosis, papilledema, uncontrollable muscle twitches, convulsions, loss of reflexes and sphincter control, coma.

Toxicological information (for the physician): Diazinon is a cholinesterase inhibitor. Atropine is antidotal. Use 1-2 mg every 15-30 minutes if necessary.

First aid: IF SWALLOWED – give patient one to two glasses of water and cause vomiting by inserting a finger down the throat; call a physician. IF IN EYES – flush with running water for 10 minutes; call a physician. IF ON SKIN – wash thoroughly with soap and water.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. May be fatal if swallowed. Harmful if inhaled or absorbed through the skin. Wear an approved respirator when handling large amounts. Avoid contact with eyes, skin and clothing. Avoid breathing fog, dust or spray mist. Wash thoroughly after handling and before eating, drinking or smoking. Do not store near food or feed.

Toxic to fish and wildlife. Highly toxic to bees exposed to direct treatment or to residues on crops. Do not spray during bloom. Birds feeding in treated areas may be killed. Do not contaminate any body of water.

11. STORAGE: Do not store or use EC near heat or open flame. Flash point 27°C.

12. DECONTAMINATION AND DISPOSAL: Spills on concrete floors – surround and cover spill with a granular carrier such as Attaclay, (cat litter). Allow carrier to absorb the liquid, then shovel into a container for disposal by burying. Wash the floor with a weak lye solution to remove any trace of pesticide. Spills on wooden floors – use same procedure as for concrete floors but repeat washing until odor disappears.

Decontaminate equipment and empty containers by thoroughly rinsing with water; dispose of rinsings by burying in non-crop land away from water supplies. Crush, break or puncture empty containers and bury with rinsings or deliver them to sanitary landfill dumps.

13. WHERE AVAILABLE: Green Cross Products Dealers, Kemsan (Western) Ltd., Later's Chemicals Ltd., Oliver Agricultural Supplies, Sanex Chemicals Inc., Pfizer Chemical Dealers.

Additional information available from:

Ciba-Geigy Canada Ltd.
8726 – 119 Street
Edmonton, Alberta
T6G 1W8
Phone: (403) 438-4850

Ciba-Geigy Canada Ltd.
6860 Century Avenue
Mississauga, Ontario
L5N 2W5
Phone: (416) 836-9445

DYFONATE (fonofos)

1. FORMULATIONS: Granules (G) – Dyfonate 10-G (10% fonofos)
2. MARKETING CATEGORY: Commercial
3. REGISTERED MIXES: Dyfonate-Thiram 5-10-G.
4. HOW IT WORKS: Fonofos is an organophosphate insecticide suitable for control of soil insects. It persists in the soil for about 56 days.
5. NUMBER OF APPLICATIONS: One per season.
6. HOW TO APPLY:

With: Ground equipment.

Rate:	**Crop**	**Insect**	**kg/ac**	**(kg/ha)**
	Potato	Tuber flea beetle, wireworms	23	**(56)**
		Wireworms	9.10	**(22.5)**

Incorporation: Potato broadcast application (for both tuber flea beetles and wireworms) – disc or roto-till to a depth of 15 cm prior to planting. Banded in-furrow application (for wireworms only) incorporate by regulated flow into fertilizer furrows.

Protective Equipment: Clean clothing and rubber gloves. Use a pesticide respirator if exposure to dust cannot be avoided.

7. APPLICATION TIPS: Potatoes – use only on irrigated soil.
8. TOXICITY: Acute oral LD_{50} = 16 mg/kg (rat)
9. SAFETY:

Symptoms of poisoning may include: nausea, vomiting, salivation, sweating, pinpoint pupils.

Toxicological information (for the physician): Fonofos is O-ethyl, S-phenyl ethylphosphonodithioate, a cholinesterase inhibitor. Atropine is antidotal. 2-PAM also is antidotal when administered early and in conjunction with atropine.

First aid: Keep airway open. Use artificial respiration if necessary. IF INGESTED – induce vomiting if patient is conscious. Call a physician.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Harmful if swallowed. Although absorption through skin of quantities sufficient to produce poisoning is unlikely, do not get on skin or clothing. Do not breathe dust. Wash immediately with soap and water after use or contact. Wear clean clothing and rubber gloves. Wash contaminated clothing with soap and hot water before wearing again.

Do not contaminate feed or food. Do not apply in any manner not specified on the label. Product is toxic to fish – do not contaminate any body of water or water supply.

11. STORAGE: Do not store in or around the home. Store away from food and feed.
12. DECONTAMINATION AND DISPOSAL: Completely empty contents of bag and bury unused chemical in an isolated location away from water supplies. Bury or burn bag and stay out of smoke.
13. WHERE AVAILABLE: Oliver Agricultural Supplies.

Additional information available from:

Stauffer Chemicals
182 Lafayette Blvd.
Lethbridge, Alberta
T1K 3Z3
Phone: (403) 329-9504

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

DYLOX (trichlorfon)

1. FORMULATIONS: Soluble Powder (SP) – (80% trichlorfon by weight)
   Solution (SN) – (420 g trichlorfon/L)

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES:

4. HOW IT WORKS: Trichlorfon is an organophosphate insecticide which works by contact and ingestion.

5. NUMBER OF APPLICATIONS: Alfalfa – one per cutting. Barley, flax, oats, wheat – repeat as necessary prior to head emergence but not after flowering to flax; one additional application may be made to barley, oats and wheat after heads emerge from sheath. Canola, sugar beets – repeat as necessary. Corn (field, sweet) – maximum of three per season with either formulation.

6. HOW TO APPLY:

With: Ground or aircraft equipment.

Rate:

Crop	Insect	g/ac	(g/ha)	L/ac	(L/ha)
		Powder		Liquid	
Alfalfa (14)	Lygus bugs, stink bugs, tarnished plant bug	610	(1500)	1.1	(2.75)
Barley, flax, oats, wheat (all 21)	Armyworms (common and true, western yellow – striped)	285	(700)	0.6	(1.5)
	Beet webworm, variegated cutworm	285-605	(700-1500)	0.6-1.1	(1.5-2.75)
	Bertha armyworm	605	(1500)	1.1	(2.75)
Canola (21)	Beet webworm	285	(700)	0.6	(1.5)
	Diamond back moth	605	(1500)	1.1	(2.75)
Corn (field, sweet) (0)	Army-worms, cutworms	285-605	(700-1500)	0.6-1.1	(1.5-2.75)
Sugar beet (14)	Beet webworm	145-285	(350-700)	0.3-0.6	(0.7-1.5)
	Dipterous leaf miners, variegated cutworm	285-605	(700-1500)	0.6-1.1	(1.5-2.75)
	Beet armyworm	605-910	(1500-2250)	1.1-1.6	(2.75-4.0)

Notes: 1. **Pre-harvest** or **pre-grazing interval** (days) given in brackets after crop.
2. Where a **rate range** is specified, use the low rate for immature insects, light infestations or sparse foliage.
Exception – webworm control on sugar beets, use high rate with low volume aerial application.

Water Volume: Use sufficient water for thorough coverage.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Protective Equipment: Wear protective clothing; wear respirator and goggles if contact with spray mist cannot be avoided.

7. SPRAYING TIPS:

Mixing SP – powder dissolves readily in water and is suitable for use in all power-operated ground sprayers and aircraft sprayers. To dissolve in water, pour the required amount into full amount of water and then agitate. Use immediately after mixing. SP should be used in sprayers equipped with 0.3 mm or larger screens. If 0.15 mm screens are used, some screen clogging may occur.

Trichlorfon is a selective insecticide: beneficial insect species are less affected. This selective advantage is lost when product is used in conjunction with or alternated with non-selective pesticides.

Corn – for early applications of SP and SN to control armyworms and cutworms, spray when plants are 7.5-30 cm high; direct the spray to the lower portions of the plant.

8. GRAZING RESTRICTIONS:

Sugar beets – do not feed, tops harvested within 28 days of treatment.

9. TOXICITY: Acute oral LD_{50} = 144 mg/kg (rat)

10. SAFETY:

Symptoms of poisoning may include: a sense of "tightness" in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea.

Toxicological Information (for the physician): Trichlorfon, an organophosphate insecticide, inhibits cholinesterase which process results in stimulation of the central nervous system. The antidote is atropine sulfate administered in large therapeutic doses repeated as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine. Do not give morphine. Watch for pulmonary edema which may develop in serious cases of poisoning even after 12 hours. At first sign of pulmonary edema, the patient should be placed in an oxygen tent and treated symptomatically.

First aid: In case of poisoning call a physician immediately. Have patient lie down and keep quiet.

IF SWALLOWED – vomiting should be induced. Administer milk or water freely and induce vomiting by giving one dose (15 ml) of syrup of ipecac. If vomiting does not occur within 10-20 minutes, administer second dose. If syrup of ipecac is not available, induce vomiting by sticking finger down throat. Repeat until vomit fluid is clear. The patient should be lying down with the head below the foot level and facing down or to one side. Professional medical assistance should be secured immediately. **Do not induce vomiting in an unconscious or convulsive person.**

IF ON SKIN – remove contaminated clothing and wash skin immediately with soap and warm water.

IF IN EYES – wash immediately with flowing water for at least 15 minutes. Get medical attention.

11. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. May be harmful if swallowed, inhaled, or absorbed through the skin. Do not get in eyes or on skin. Do not breathe dust or spray mist. Always wash thoroughly with soap and warm water after handling. Wash contaminated clothing with soap and hot water before reuse. Do not contaminate feed or food.

Do not apply Dylox to, or allow spray to drift onto, varieties of sorghum which are sensitive to phosphates. To do so may cause burning of the sorghum or milo.

Do not use on other crops used for food or forage. Use only according to label directions. Application at rates above those shown may result in illegal crop residues. Do not treat food crops grown in the greenhouse. To protect fish and wildlife, do not contaminate streams, lakes or ponds.

12. STORAGE: Store in a cool, dry area. Store the liquid formulations above 0°C and away from excessive heat and open flame. Store in an area specially designated for pesticides. Do not store near any material intended for use of or consumption by humans or animals. Do not store in or around the home.

13. DECONTAMINATION AND DISPOSAL: Destroy empty container by burying at least 50 cm deep in a non-crop, non-graze area away from water sources or by burning – stay clear of smoke or fumes.

14. WHERE AVAILABLE: Oliver Agricultural Supplies, Alberta Wheat Pool, Pioneer Grain, Cargill Grain, Pfizer Chemical Dealers.

Additional information available from:

Chemagro Ltd.
#203, 610 – 70 Avenue S.E.
Calgary, Alberta
T2H 2J6
Phone: (403) 259-2863

Chemagro Ltd.
1355 Aerowood Drive
Mississauga, Ontario
L4W 1C2
Phone: (416) 625-5280

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

FURADAN (carbofuran)

1. FORMULATIONS: Granular – 5G (5% carbofuran)
   – 10G and CR-10 (10% carbofuran)
   Flowable – (480 g carbofuran/L)

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES: Flowable formulation may be tank-mixed with phenoxy ester or amine herbicides and should be used only on crops listed on both lables. Compatible with most fungicides. Do not mix with Bordeaux or hydrated lime.

4. HOW IT WORKS: Carbofuran is a broad-spectrum, systemic, carbamate insecticide, acaricide and nematicide which works by contact.

5. NUMBER OF APPLICATIONS:

   Granular – one per season.
   Flowable: Oilseeds – for flea beetle control, one application at 110 mL/ac **(275 mL/ha)** or two applications totalling not more than 110 mL/ac **(275 mL/ha)**.
   Grains and forages – two applications at 110 mL/ac **(275 mL/ha)** or, for alfalfa weevil, one at 225 mL/ac **(550 mL/ha)**.
   Corn – four applications for corn borer.
   Potatoes – repeat as necessary.

6a. HOW TO APPLY: Granular

Rate:

Crop	**Insect**	**Formulation**	**kg/ac**	**(kg/ha)**
Canola, mustard	Flea beetles	5G or	1.8-2.2	**(4.5-5.5)**
		CR-10	1.1	**(2.8)**
Potato	Colorado potato beetle, potato flea beetle, potato leafhoppers	10G	13.2 Using 90 cm row spacing or 300 g/100 m of row.	**(32.5)**
Sugar beet	Sugar beets root maggot	10G	3.4	**(8.5)**

Note: – Use the high rate if a severe infestation is anticipated.

Incorporation: Canola, mustard – for seed drill application only; not valid for application with discer seeders. Do not harrow after seeding. Mix granules and seed thoroughly. Check for accurate calibration.
Potatoes – apply as a 10 cm wide band into seed furrow or drill into the soil 10 cm on each side of row and 5 cm below seed.
Sugar beets – apply directly into seed furrow at same depth as seed or slightly above seed. Do not mix seed, fertilizer and insecticide in same hopper.

Protective Equipment: Wear protective clothing and, if exposure to dust cannot be avoided, a pesticide respirator and goggles.

6b. HOW TO APPLY: Flowable

With: Ground or aircraft equipment.

Rate:

Crop	**Insect**	**mL/ac**	**(mL/ha)**
Alfalfa (7)	Alfalfa weevil	225	**(550)**
Alfalfa (1), barley (21), canola(60), corn – sweet (7), field (3) flax (21), mustard (21), oats (21), pasture (1), sweet clover (28), wheat (21)	Grasshoppers	110	**(275)**
Canola (60), mustard (21)	Flea beetles	60-110	**(150-275)**

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

	Red turnip beetle	110		(275)
Corn (field, silage, sweet, (7)	European corn borer		445	**(1100)**
Potato(7)	Any of: aphids, potato flea beetle, potato leafhopper or tarnished plant bug alone or in combination with Colorado potato beetle.		445	**(1100)**
Potato(7)	Colorado potato beetle		225	**(550)**

Notes: 1. Pre-harvest or pre-grazing interval (days) given in brackets after crop.
2. Canola – use the high rate for severe infestations.
3. Potatoes – use 690 mL/ac **(1.75 L/ha)** if large nubmers of aphids are present.

Water Volume: Ground application – not less than 40 L/ac **(100 L/ha)**, use sufficient water for thorough coverage. Aerial application – not less than 20 L/ac **(50 L/ha)**. Potatoes – use 325-405 L/ac **(800-1000 L/ha)** at a minimum pressure of 875 kPa.

Protective Equipment: Wear protective clothing, a pesticide respirator and goggles.

7. SPRAYING TIPS: Check the label for calibration of various types of granular applicators. If seed decay, seedling blight or damping-off diseases are a problem, treat seed with a recommended fungicide. Canola and mustard may also require a foliar treatment after seeding with granules. Check fields shortly after emergence. Alfalfa – apply when 25% of tips show feeding damage by alfalfa weevil. In general, apply foliar sprays when insects or feeding damage first appears. Boom sprayers – equip with hydraulic or mechanical agitation and 0.3 mm screens; remove any felt filters.

8. GRAZING RESTRICTIONS: Sugar beet tops and pulp may be fed to livestock without causing residues in milk or meat. Note grazing wait periods in section 6b.

9. TOXICITY: Acute oral LD_{50} = 11 mg/kg (rat)

10. SAFETY:

Symptoms of poisoning: Typical cases involving blurred vision, nausea, excessive perspiration and a sense of weakness have been reported in formulators and applicators. Additional symptoms may include headache, light-headedness, constriction of pupils, cramps, salivation and vomiting.

Toxicological information (for the physician): Carbofuran is a reversible cholinesterase inhibitor. Give atropine 2 mg intravenously. If in eyes, instill one drop of Homatropine. Do not use oximes such as 2-PAM.

First aid: IF SWALLOWED – vomiting should be induced. **Do not induce vomiting in a convulsive or unconscious person.** Administer milk or water freely and induce vomiting by giving one dose (15 ml) of syrup of ipecac. If vomiting does not occur within 10 to 20 minutes, administer a second dose. If syrup of ipecac is not available, induce vomiting by sticking finger down throat. Repeat until vomit fluid is clear. Patient should be lying face down or on side with the head below foot level. Professional medical assistance should be secured immediately.

IF INHALED – have victim lie down and remain quiet.

IF ON SKIN – remove contaminated clothing and immediately wash skin with soap and water.

IF IN EYES – flush eyes with plenty of water for at least 15 minutes. Call a doctor immediately.

11. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN.

DANGER – Do not breathe spray mist or dust. Wear goggles at all times. Wear a respirator when breathing of spray mist or dust is unavoidable.

Wear coveralls at all times. Never handle product with bare hands – use rubber or neoprene gloves. Do not use leather or cloth gloves.

Wash hands, face, neck and arms thoroughly after handling product and before eating or smoking. Take a complete bath at end of day. Change clothing each day after using product. Wash clothes in detergent, bleach and hot water.

Very poisonous to bees – do not apply when crops are in bloom or allow spray to drift toward beehives. Applications by both ground and air are permitted, provided there is no hazard of drift or application to areas occupied by people or livestock. Remove cattle before spraying. Do not contaminate feed or food. Keep out of areas inhabited by fish, birds and wildlife – this insecticide is highly toxic to such animals.

12. STORAGE: Store away from food and feed. Do not store in or around the home. Store in a safe, cool place. Protect flowable from freezing.

13. DISPOSAL: Puncture and bury empty containers at least 50 cm deep away from water supply in a non-crop, non-graze area. Do not reuse empty container.

14. WHERE AVAILABLE: Alberta Wheat Pool, Oliver Agricultural Supplies, Cargill Grain, Pfizer Chemical Dealers, Pioneer Grain.

Additional information available from:

Chemagro Ltd.
1355 Aerowood Drive
Mississauga, Ontario
L4W 1C2
Phone: (416) 625-5280

Chemagro Ltd.
#203, 610 – 7th Ave. S.E.
Calgary, Alberta
T2H 2J6
Phone: (403) 259-2863

GASTOXIN, PHOSTOXIN (phosphine)

1. FORMULATIONS: 3 g tablets (release 1 g phosphine upon decomposition).
   0.6 g pellets (release 0.2 g phosphine upon decomposition).
2. MARKETING CATEGORY: Restricted. A permit must be obtained from your local Agricultural Fieldman or Alberta Environment prior to purchase or use of these products.
3. REGISTERED USES: Raw agricultural products, grain, processed foods and feeds.
4. HOW IT WORKS: Phosphine (hydrogen phosphide) is a colourless gas with a carbide-like odour and high volatility. Formulated product consists of aluminium phosphide, ammonium bicarbonate, urea and paraffin. Upon exposure to air, the ammonium bicarbonate breaks down to form ammonia (a pungent, warning gas) and carbon dioxide (a fire suppressant). Within one to four hours, depending on temperature and humidity, the product begins to release phosphine and decompose. The effectiveness of fumigation is primarily dependent upon temperature, tightness of seal, the type of storage space, adequate exposure time and proper dosage.
5. INSECTS: When used as directed, phosphine will effectively control all stages of the following pests: granary and rice weevils, saw-toothed grain beetle, flat or rusty grain beetle, khapra beetle, lesser grain borer, flour beetles, cadelle, dried fruit moth, Mediterranean flour moth, Angoumois grain moth, Indian meal moth, almond moth, bean weevil, dermestids, raisin moth and tobacco moth.
6. HOW TO APPLY:

Rate: Raw agricultural commodities, grain and bulk animal feeds – 4-6 tablets per cubic meter (60-180/1000 bu.), or 5-10 pellets per cubic meter (120-300 pellets/1000 bu.).

Processed foods – 16 tablets per 10 cubic meters (30-60/1000 cubic ft.) or 6 pellets per cubic meter (100-200/1000 cubic ft.) of storage space.

Exposure Times:

Commodity temp. °C	Exposure time	(tablets)
over 20	3 days	
16-20	4 days	pellets one day less
12-15	5 days	
5-11	10 days	
below 5	Do not Fumigate	

Protective Equipment: It will be necessary to don a gas mask if: (i) a structure under fumigation must be entered in case of emergency or (ii) a structure must be entered to commence aeration procedure. Otherwise, it is not necessary to wear a gas mask when product is applied according to label directions. Wear gloves when handling the product.

7. APPLICATION TIPS:

General:
- Never fumigate alone.
- Have correct personal protection equipment on hand and in good working order.
- Have appropriate gas detection devices available for use as needed.
- Never fumigate any structure or area unless it is unoccupied.
- When necessary, make certain to notify police and fire officials having jurisdiction over the area of the planned fumigation.
- Never fumigate when commodity temperature is below 5°C.
- Aerate finished food for 48 hours before it is offered to the consumer.

For Fumigating Flat Storages:
- Make certain that the structure is tight enough to be fumigated successfully. Seal structure as needed.
- Make certain that there are no adjoining structures occupied by man or animals.
- Determine quantity of tablets or pellets required.
- During fumigant application leave all doors or other openings open to create a cross ventilation. Application can proceed for 2-4 hours or until the odor of phosphine is detected in the overspace.
- Apply the tablets or pellets by using a probe. Make probes every 4-5 feet horizontally across the grain in both directions. The number of tablets or pellets used per probe is determined by dividing the amount of fumigant to be used by the number of probings to be made. The fumigant is dropped in the probe at intervals as the pipe is withdrawn from the grain.
- A plastic tarp may be pulled over the grain surface following application. This reduces convection currents and increase the effectiveness of the fumigant. Care must be taken to see that the plastic is removed when the fumigation is completed (no more than 5-6 days or sweating of the grain may occur).
- Close and seal all external openings.
- Placard and lock all entrances.
- Following the exposure period, open doors and windows creating a cross draft to aid in aeration.
- Make certain all warning signs are removed when aeration is complete.

For Fumigation of Railcars:

- Boxcars and hopper cars of bulk raw agricultural commodities and animal feeds are fumigated in the same manner as are silos or flat storages. The tablets or pellets may be added to the commodity as it flows into the railcars, placed on the floor of the empty car, placed on the surface of the commodity, or probed after loading is completed.
- Processed foods and bagged raw commodities and animal feeds are fumigated by placing the tablets or pellets in moisture permeable envelopes or on trays, which in turn are fastened to a substantial support within the car. Care must be taken to see that the fumigant or its reacted residue does not come in contact with processed foods.
- Close and seal all hatches or doors. On hopper cars, make sure that vents at the ends of cars are sealed with masking tape. Approved warning signs must be applied to each door of box cars and near the ladder on hopper cars as well as on the top hatch covers. Date signs as to when fumigation commenced and when the car may be opened.
- Notify the consignee that the car is to be received under fumigation.

For Fumigating Silo Type Storages:

- Calculate required number of tablets or pellets based on dosage selected and quantity of commodity to be treated.
- Determine the amount of ventilation in both the basement and on the bin floor where the fumigant will be applied.
- Open all containers outside the building.
- Tablets may be applied to grain on the transfer belt by hand. Pellets are best applied using an automatic pellet dispenser. They may be dispensed into the up leg of the elevator from the workroom floor, or onto the grain as it travels along the transfer belt on the bin floor.
- Place a warning sign on the bin cover on the bin floor, and on the bin valve in the basement. Date the sign as to when the fumigation commenced.
- Each day before work starts, the bin floor and basement should be checked for the presence of gas.
- Elevator personnel may carry out their normal duties when Gastoxin is used to treat grain in upright silo storage.

For Fumigation Under Tarpaulins:

- Cover the stack of product to be fumigated with polyethylene (1.5-2 mL is satisfactory). Secure the edges of the tarp to the floor using sand snakes, tape, or other suitable material.
- Spread tablets or pellets on trays and insert under the edge of the tarp. Reseal tarp to the floor in that location.
- Placard stack on all exposed sides indicating that fumigation is in progress. Date and sign warning placard indicating when cover may be removed.
- Maintain adequate ventilation around stack at all times. If this is done workers do not have to vacate the premises.
- Following the exposure period, collect all residual dust and dispose of it according to label directions. Remove tarps if desired. All warning signs must be removed.

8. SAFETY:

Symptoms of poisoning: Severity is dependent on concentration of hydrogen phosphide involved. Mild poisoning results in fatigue, nausea, pressure or pain in the chest, ringing in the ears, and uneasiness. Hydrogen phosphide is not a chronic poison, and these symptoms will readily disappear with rest and fresh air.

Greater quantities of gas produce such symptoms as vomiting, stomachache, diarrhea, disturbance in equilibrium, and dyspnea (difficulty in breathing). Very high concentrations quickly cause cyanosis (bluish-purple skin color), agitation, ataxia (poor muscle co-ordination), anoxemia (sub-normal blood oxygen content), unconsciousness and death. Death can occur very quickly, or be delayed several days as a result of pulmonary edema and collapse, by paralysis of the central respiratory system. In cases of severe poisoning, disturbance in liver and kidney function can also occur (hematuria, proteinuria, uremia, jaundice), as can arrhythmia.

Toxicological information (for the physician): To be used in accordance with his own best judgement.

- Mild cases of poisoning may not be manifest for up to 24 hours and the following is recommended:
  - (a) Complete bed rest for 1-2 days during which time the patient should be kept warm and quiet.
  - (b) As poisoning is not chronic, symptoms will disappear by themselves.
- Severe poisoning will be readily apparent. Steroid therapy should be considered when pulmonary edema is observed, and close medical supervision is suggested. Blood transfusions may also be required.
- In case of suicide attempts by swallowing tablets or pellets, the stomach should be flushed with a dilute solution of potassium permanganate or a solution of magnesium peroxide until flushing liquid ceases to smell of carbide. Thereafter administer carbo medicinalis.

First aid: Should exposure to hydrogen phosphide be documented or suspected:

- Remove patient from gas atmosphere to open air.
- Call a physician immediately.
- Have patient lay down, keeping him warm and comfortable. Treat as for shock.
- Make no antidotal use of fats, oil, butter, or milk. Do not administer atropine as it is contraindicative.
- Commence artificial respiration if breathing has ceased.
- When exposure to low concentrations of hydrogen phosphide have been documented or suspected, the individual involved should rest for 24 hours and under no circumstances should he resume any work dealing with fumigation.

9. PRECAUTIONS: Hydrogen phosphide gas is very toxic to all forms of animal life, and exposure to even small amounts should be prevented. Poisoning results from ingestion or inhalation as hydrogen phosphide is not absorbed through the skin. It is also insoluble in water, fats, and oils.

Make certain that the label is intact and legible. Read the label. Open containers only in open air and with the opening pointing away from your face. Wear gloves when handling the product. Do not smoke, eat or drink when handling any pesticide. Use entire contents of a tube once it is opened. Unopened tubes and resealable flasks may be returned to the locked storage area for later use. Wash hands after use of the product.

Never let tablets or pellets come in direct contact with liquid – this causes the immediate release of hydrogen phosphide. Product should never be used under conditions which would allow the gas concentration to reach the lower level of flammability which is 1.79% by volume (17,900 ppm). When used according to label directions the amount of gas produced remains far below the lower flammability level. Never confine the product in small gas proof enclosures such as plastic bags. Such confinement could cause the gas concentration to reach the lower flammability level. Take precautions in areas where copper, brass or gold are present, as corrosion may occur. Never fumigate in areas containing electronic or telephone equipment, photographic film or copy paper. It may be possible to remove such items or protect them from exposure to the gas. Suggested exposures should be observed. A shortened exposure period cannot be compensated for by increased dosage. Hydrogen phosphide has great penetrating powor and gas may slowly seep through concrete block walls. See that adjoining areas are not used as living quarters during the fumigation period. Hydrogen phosphide does not layer, but expands to fill the available space. Because of its high volatility and penetrating ability, the enclosure being treated must be sealed as tightly as possible if an effective fumigation is to be expected. Disposal of the dust remaining after a space fumigation must be carefully and properly done. See "Disposal" for further information.

10. STORAGE: Tablets and pellets are received in wooden cases containing sealed tubes and cans, or resealable flasks. As long as the tubes, cans or flasks remain intact, the storage life of the product is unlimited. Storage should be in a dry, locked, ventilated area and out of the reach of children and irresponsible persons.

11. DECONTAMINATION AND DISPOSAL: Do not attempt to reuse empty containers. Triple rinse with water, crush, and dispose of properly. Bury cans and stoppers.

When product is used to fumigate raw agricultural commodities and bulk animal feed there are no special disposal procedures. When the commodity is moved, the residual dust is further decomposed and removed along with the grain dust.

When processed foods are fumigated the dust must be collected and disposed of by burying, or by slowly adding the dust to a bucket of water containing a small amount of wetting agent (detergent). A five gallon bucket should be 3/4 full of water and detergent. The dust is stirred into the water until a slurry is formed and the dust sinks. It is then clay, and is no longer a contaminant.

13. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain, Pioneer Grain, United Grain Growers Ltd.

Additional information available from:

Phoenix Chemicals Ltd.
P.O. Box 1136
Winnipeg, Manitoba
R3C 2Y4
Phone: (204) 257-4000

GUTHION (azinphos-methyl)

1. FORMULATIONS: Spray concentrate (SC) – (240 g azinphos-methyl/L)
   Wettable powder (WP) – (50% azinphos-methyl)

2. MARKETING CATEGORY: Restricted (to be stored or displayed apart from food or feed).

3. HOW IT WORKS: Azinphos-methyl is a contact, non-systemic, organophosphate insecticide and acaricide of long persistence.

4. NUMBER OF APPLICATIONS: One per season on barley, oats, rye, sugar beets, wheat. One per season on alfalfa and clover except two per season for sweet clover weevil control or when using rates of 910 mL SC/ac **(2.25 L SC/ha)** or less. Repeat as necessary on canola and potatoes.

5. HOW TO APPLY:

With: Ground or aircraft equipment.

Rate:

Crop(*)	**Insect**	Liquid		Powder	
		Qty/ac	**(Qty/ha)**	Qty/ac	**(Qty/ha)**
Alfalfa (21), Clover (21)	Alfalfa plant bug, alfalfa weevil, aphids, leafhoppers, lygus bugs, spittle bug	0.9-1.4 L	**(2.25-3.5 L)**	445-710 g	**(1.1-1.75 kg)**
	Sweet clover weevil	910 mL	**(2.25 L)**	445 g	**(1.1 kg)**
Canola (30)	Diamondback moth	225-505 mL	**(0.55-1.25 L)**	110-225 g	**(275-550 g)**
	Flea beetles	110-225 mL	**(275-550 mL)**	60-110 g	**(150-275 g)**
Canola (30)	Red turnip beetle	225-345 mL	**(550-850 mL)**	110-170 g	**(275-425 g)**
Potato (7)	Aphids	1.4 L	**(3.5 L)**	710 kg	**(1.75 kg)**
	Colorado potato beetle	510-710 mL	**(1.25-1.75 L)**	225-345 g	**(550-850 g)**
Potato (7)	Flea beetle, leafhoppers, spittle bug, tarnished plant bug	0.9-1.42 L	**(2.25-3.5 L)**	445-710 g	**(1.1-1.75 kg)**
Sugarbeet (100)	Flea beetles	110 mL	**(275 mL)**	60 g	**(150 g)**

* Notes: – **Pre-harvest interval** (days before cutting for food, feed or forage) given in brackets after crop.
– **Rate range** – use the low rate on immature insects, light infestations or sparse foliage.

Water Volume: Use sufficient water for thorough coverage
– generally, a minimum of 32 L/ac **(80 L/ha)** with ground equipment and 16 L/ac **(40 L/ha)** with aerial application. Alfalfa weevil – use 60-80 L/ac **(150-200 L/ha)** on heavy growth.

Nozzles: When spraying canola and sugar beets, wettable powder may be applied using any commercial tractor, or drawn or self-propelled field sprayer provided it is equipped with the following:
(i) nozzle tips no finer than 6502, 8002 or TK2 with nozzle screens no finer than 0.3 mm. The above tips will provide 40 L/ac **(100 L/ha)** when operated at 8 km/hr and 200 kPa.
(ii) 0.3 mm or larger line strainers or screens. Note that felt filters, smaller nozzle tips or smaller screens will become clogged when using the wettable powder formulation.

Protective Equipment: Protective clothing, pesticide respirator, goggles and, when handling concentrates, rubber gloves.

6. SPRAYING TIPS: For red turnip beetle, spray an 18-30 m wide band around the field or where beetles are causing damage. Repeat as necessary.

   Mixing: The wettable powder mixes easily with water. Mix the required amount of powder with a small quantity of water. Add this pre-mix through the screen while filling the sprayer tank or fill the tank to the required level and then add the pre-mix. Operate the agitator while mixing.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

The spray concentrate forms an emulsion when diluted with water and is suitable for use in all power-operated ground sprayers and aircraft sprayers. To mix, pour the required amount of spray concentrate into full amount of water and then agitate.

Spraying: Work to windward. Protect sprayer operators from drift or mist. When low volumes of spray are applied, complete coverage and thorough application are essential for most effective results. Schedule applications in accordance with local conditions.

7. GRAZING RESTRICTIONS: Do not graze treated areas within 21 days of application.

8. TOXICITY: Acute oral LD_{50} = 11 mg/kg (rat)

9. SAFETY:

Symptoms of poisoning: A sense of "tightness" in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea.

Toxicological information (for the physician): Compound inhibits cholinesterase, resulting in stimulation of the central nervous system, the parasympathetic nervous system, and the somatic motor nerves. Do not give morphine. Watch for pulmonary edema which may develop in serious cases of poisoning even after 12 hours. At first sign of pulmonary edema, the patient should be placed in an oxygen tent and treated symptomatically.

Antidote – Administer atropine sulfate in large therapeutic doses. Repeat as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine.

First aid: In case of poisoning call a physician immediately. Have patient lie down and keep quiet.

IF SWALLOWED – vomiting should be induced. Administer water freely and induce vomiting by giving one dose (15 mL) of syrup of ipecac. If vomiting does not occur within 10-20 minutes, administer second dose. If syrup of ipecac is not available, induce vomiting by sticking finger down throat. Repeat until vomit fluid is clear. The patient should be lying down with the head below the foot level and facing down or to one side. Professional medical assistance should be secured immediately. **Do not induce vomiting in an unconscious or convulsive person.**

IF ON SKIN – remove contaminated clothing and wash skin immediately with soap and warm water.

IF IN EYES – wash immediately with flowing water for at least 15 minutes.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN.

Poisonous if swallowed, inhaled, or absorbed through the skin. Do not get in eyes or on skin. Wear protective clothing, natural rubber gloves, and goggles. Do not breathe dust or spray mist. Wear a pesticide respirator.

Do not contaminate feed or food. Keep all unprotected persons out of the operating area or vicinity where there may be danger of drift. Workers who must enter treated fields within 2 days of application should wear protective clothing. Wash hands, arms, and face thoroughly with soap and warm water before eating or smoking. Wash all contaminated clothes with soap and hot water before reuse.

Do not use on other crops used for food or forage. Use only according to label directions. Application at rates above those shown may result in illegal crop residues. Do not use on food crops grown in the greenhouse. To protect fish and wildlife, do not contaminate streams, lakes, or ponds. This product is highly toxic to bees exposed to direct treatment or residues on crops. Do not apply when crop is in bloom or allow spray to drift towards beehives.

11. STORAGE: Store wettable powder in a cool, dry place. Do not store spray concentrate below –4°C. Protect products from heat and open flame. Do not heat.

12. DECONTAMINATION AND DISPOSAL: Do not reuse container. Completely empty the container. Rinse empty drum by filling with water and adding 250 mL household lye/25 L water; punch holes in top and bottom and crush. Bury unused chemical, rinse solution and crushed container at least 50 cm deep in a non-crop, non-graze area away from water supply.

13. WHERE AVAILABLE: Alberta Wheat Pool, Cargill Grain, Oliver Agricultural Supplies, Pioneer Grain, Pfizer Chemical Dealers.

Additional information available from:

Chemagro Ltd.
1355 Aerowood Drive
Mississauga, Ontario
L4W 1C2
Phone: (416) 625-5280

Chemagro Ltd.
#203, 610 – 70 Ave. S.E.
Calgary, Alberta
T2H 2J6
Phone: (403) 259-2863

*******LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE******

LANNATE; NUDRIN (methomyl)

1. FORMULATIONS: Solutions (SN) – Lannate L (215 g methomyl/L)
   – Nudrin (216 g methomyl/L)
   Wettable powder (WP) – Lannate (90% methomyl)
2. MARKETING CATEGORY: Commercial
3. REGISTERED MIXES: None specified.
4. HOW IT WORKS: Methomyl is a carbamate insecticide which works by contact and ingestion and has some systemic action. Rapidly degraded in green, growing plants; short-term residual. Rapid knock-down.
5. NUMBER OF APPLICATIONS: As needed, no restriction on number of application per season.
6. HOW TO APPLY:

With: Ground equipment (all crops) or aircraft (canola, flax, wheat, oats and barley).

Rate:

Crop	Insect	L/ac	**(L/ha)**	g/ac	(g/ha)
		Liquid		**Powder**	
Canola (8)	Alfalfa looper, bertha armyworm, beet webworm, clover cutworm	0.4-0.5	**(0.9-1.25)**	90-205	**(216-510)**
Corn, sweet (3)	Corn earworm	0.75-1.1	**(1.8-2.75)**	175-255	**(430-625)**
	European corn borer	1.1	**(2.6)**	255	**(625)**
Flax (8)	Bertha armyworm, flax bollworm	0.4-0.5	**(0.9-1.25)**	90-110	**(220-270)**
Potato (3)	Aphids, flea beetles, leafhoppers	0.9	**(2.25)**	220	**(540)**
Wheat (20), oats(20) barley(20)	Common armyworm	0.5-0.9	**(1.25-2.25)**	110-210	**(270-540)**
	Thrips	0.5	**(1.25)**	120	**(300)**

Notes: 1. **Pre-harvest interval** *(days) given in brackets after crop.*
2. When a **rate range** is specified, use the low rate only for very young insects, small plants or light infestations.

Water Volume: Ground spray – use 20-60 L/ac **(50-150 L/ha)** ; Aerial spray – use a minimum of 16 L/ac **(40 L/ha)**

Protective Equipment: Wear goggles or mask, respirator, rubber gloves, coveralls when mixing, loading, applying or otherwise handling the product.

7. SPRAYING TIPS: Apply at the recommended rates in sufficient water to obtain thorough, uniform coverage. Best control is obtained when spray schedules are initiated on young insects. Repeat application as necessary. Early morning or late evening sprays are recommended.

   Wettable powder is packaged in a water soluble bag – entire contents dissolve in water. After opening drum, immediately dump entire contents into spray tank. Do not touch bag: handling may cause breakage. Do not puncture bags for any reason. Use proper size of product for area to be sprayed. Avoid exposing soluble bags to air or skin.

   Fill spray tank 25% to 50% full of water. Add proper amount of product directly to the spray tank and continue filling with water. Mix thoroughly; once mixed continued agitation is not necessary. Use mechanical or hydraulic means; do not use air agitation.

   On sweet corn – for earworm, spray whorls as needed and silks at 2-4 day intervals or as needed; for European corn borer consult your district agriculturist – spray at 3-5 day intervals or as needed when insects first appear.

8. TOXICITY: Acute oral LD_{50} = 17 mg/kg (rat)

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

9. SAFETY:

Symptoms of poisoning: Methomyl is a cholinesterase inhibitor. Symptoms may include weakness, blurred vision, headache, nausea, abdominal cramps, discomfort in the chest, constriction of pupils, sweating, slow pulse, muscle tremors.

Toxicological information (for the physician): Atropine sulfate is antidotal. Administer repeated doses, 1.2-2.0 mg, intravenously every 10-30 minutes until full atropinization is achieved. Maintain atropinization until the patient recovers. Artificial respiration or oxygen may be necessary. Allow no further exposure to any cholinesterase inhibitor until recovery is assured. Do not use morphine or 2-PAM. However, for exposure to "Lannate" and organophosphorous insecticides, 2-PAM may be used as required to supplement the atropine sulfate treatment as described above.

First aid: Atropine is an antidote – consult physician for emergency supply of 1/100 grain atropine tablets. Call a physician at once in all cases of suspected poisoning.

IF SWALLOWED – induce vomiting immediately. This may be done by introducing a finger into the throat or by giving 30 mL of syrup of ipecac and 2 glasses of water to an adult (or 15 mL in 1 glass of water to a child).

IF INHALED – remove from exposure. Have patient lie down and keep quiet. If patient is not breathing, start artificial respiration immediately. **Never give anything by mouth to an unconscious person.**

IF ON SKIN – wash contaminated skin with plenty of soap and water.

IF IN EYES – flush with water for at least 15 minutes. Get medical attention.

If warning symptoms appear (see Symptoms above) before physician arrives, immediately swallow two atropine tablets (each 1/65 mg); thereafter, every 10-15 minutes, take one atropine tablet (1/65 mg) until throat becomes dry and skin becomes dry and flushed. Take additional tablets as necessary to maintain a moderately dry throat and dry, flushed skin until physician arrives.

10. PRECAUTIONS:

KEEP AWAY FROM CHILDREN. **Danger! May be fatal if swallowed or inhaled. May cause blindness if swallowed.**

Do not breathe vapours or spray mist. Do not get in eyes, on skin, on clothing. Extremely flammable – keep away from fire, sparks, and heated surfaces. Keep container closed. Use with adequate ventilation.

Not for use or storage in or around the home. Keep animals and unprotected persons out of operational areas during treatment and while there is danger of drift. Pilot should not assist in the mixing and loading operations.

This product is toxic to fish and wildlife. Keep out of lakes, streams or ponds and areas of natural vegetation. Do not apply where runoff is likely to occur. Do not apply when weather conditions favour drift from areas treated. This product is toxic to bees and should not be applied when bees are actively visiting the area.

Wear a pesticide respirator. Wear goggles when handling or using. Wear clean clothes daily. Wash thoroughly after handling and before eating or smoking. Do not contaminate food or feed.

11. STORAGE: Do not store in or around the home, or store near food or feed. Do not store below 0°C. Allow wettable powder bags to warm to 10°C before handling. Above 136°C, product decomposes and may explode if confined.

12. DECONTAMINATION AND DISPOSAL:

Spill or Leak Procedure. Do not breathe dust. Do not get in eyes, on skin or clothing. Keep people away and upwind of spill/leak. If necessary to enter the spill area, wear dust mask or self-contained breathing apparatus, gloves, boots and protective clothing. Try to remove leaking containers and put them into leak-proof containers. Sweep up spills; apply earth, sand or sweeping compound to spill area and re-sweep to pick up residue. Package spill material in plastic, cardboard or metal containers; bury in a safe place away from water supplies. If product enters crevices and cannot be effectively swept, treat with a sodium hydroxide (Drano) water solution and allow to stand 4 hours. Thereafter, flush well with water; do not flush into any body of water. If product enters sewers or bodies of water, notify appropriate local and federal authorities. NOTE: Sodium hydroxide causes burns. Do not get in eyes, on clothing. In case of contact, flush eyes or skin with plenty of water; call a physician. When handling, wear goggles in addition to boots and gloves.

Dispose of in accordance with applicable provincial regulations. If buried, disposal should be on a site approved for burial of highly toxic, water-soluble materials. Disposal site should be on level ground and not close to streams, ponds, lakes, wells or ditches. Do not re-use container.

13. WHERE AVAILABLE: Alberta Wheat Pool and Oliver Agricultural Supplies carry stock. Federated Co-operatives, Pfizer Chemical Dealers, Chipman Inc. and Cargill are also suppliers.

Additional information available from:

DuPont Canada Inc. 43 d Cameron Crescent Red Deer, Alberta T4P 2C9 Phone: (403) 347-2028	DuPont Canada Inc. Regency Centre #105 333 – 25 Street East Saskatoon, Saskatchewan S7K OL4 Phone: (306) 244-4511

LINDANE (gamma BHC)

1. FORMULATIONS: Dusts (12-75% gamma BHC by weight)
   Solutions (15.7-21.5%)
   Suspensions (10-49.9%)
   Wettable powders (16.6-50%)

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES: Most commercial formulations of lindane for seed treatment are mixed with one, two or three fungicides (any of: benomyl, captan, carbathiin, maneb, TCMTB, thiram). The insecticide diazinon is added to some.

4. HOW IT WORKS: Lindane is an organochlorine insecticide which works by ingestion, by contact and has some fumigant action.

5. NUMBER OF APPLICATIONS: Once, as a seed treatment.

6. HOW TO APPLY:

With: Seed treater or as a drill-box mix.

Rate:

Crop	**Insect**	**Rate**
Canola (seed treatment)	Flea beetle	Varies with formulation, follow label for specific dosage.
Cereals, corn, sugar beets (seed treatment)	Wireworms	Varies with formulation, follow label for specific dosage.

Notes: – When a rate range is given, use the high rate for severe infestations (for example, after successive cropping of flea beetle-susceptible crops in the same or adjacent fields).

Protective Equipment: Rubber gloves when handling concentrated product or treated seed. Pesticide respirator and goggles when treating seeds. Coveralls.

7. APPLICATION TIPS: Use mineral oil or linseed oil as a sticker (150 mL/25 kg seed) when applying the high rate of dust as a seed treatment for severe flea beetle infestation by (i) mixing oil and seed to coat, (ii) mixing again with dust and (iii) using planting equipment that can be satisfactorily adjusted to compensate for the increased coating on the seed.

8. GRAZING AND CROPPING RESTRICTIONS: Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for four weeks after planting.

9. TOXICITY: Acute oral LD_{50} = 88-91 mg/kg (rat)

10. SAFETY:

Symptoms of poisoning may include: nausea, vomiting, hyper-irritability, convulsions, coma and other symptoms typical of organochlorine poisoning.

Toxicological information (for the physician): Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenalin.

First aid: IF SWALLOWED – induce vomiting by sticking a finger down the throat or by giving syrup of ipecac. Rush patient to nearest hospital and take the container label with you. Because of all the formulations with fungicides, the label information will be important in providing medical treatment.

IF ON SKIN – remove contaminated clothing and wash skin with soap and water.

IF IN EYES – flush with plenty of water for 15 minutes. Get medical attention.

11. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN.

Hazardous if inhaled, swallowed or absorbed through the skin. When handling product or treated seed, work in a well-ventilated area and wear a pesticide respirator, goggles, gloves and coveralls. Do not breathe the dust. After handling, wash thoroughly with soap and water (and before eating or smoking); change to clean clothing – launder clothing before wearing again.

Do not apply or allow entry into streams, lakes or ponds. Lindane is toxic to fish, birds and other wildlife – do not allow access to wildlife.

If treated seed is to be stored before use (dry, treated seed may be stored for several months), label as follows: "Poisonous to Man and Animals. Do Not Use as Feed. This Seed is Treated With Lindane for Control of Insects."

12. STORAGE: Store in a cool, dry place away from the home and away from food and feed. Liquid products may be frozen; crystals will dissolve when warmed to 0°C.

13. DECONTAMINATION AND DISPOSAL: Either burn empty containers, staying clear of smoke, or puncture and crush empty containers, then bury at least 50 cm deep away from any water source.

14. WHERE AVAILABLE: Most elevator companies and chemical dealers.

Additional information available from:

Chipman Inc.
Box 836
4605 – 101 Avenue
Edmonton, Alberta
T5J 2L4
Phone: (403) 465-5849

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5

Phone: (204) 786-3421

LORSBAN (chlorpyrifos)

1. FORMULATIONS: Emulsifiable concentrate – Lorsban 4E (480 g/chlorpyrifos/L)

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Chlorpyrifos has a broad range of insecticidal activity and works by contact, ingestion and vapour action. It is non-systemic and, at the recommended rates, non-phytotoxic.

4. NUMBER OF APPLICATIONS: Once per season as (i) a foliage treatment of barley, oats, wheat and canola, (ii) as a seedling or soil treatment of potatoes and (iii) as a seedling treatment of canola, flax, sugar beet and sunflower. Not more than 9 weekly applications on potato foliage.

5. HOW TO APPLY:

With: Ground (all) or aerial equipment (canola and flax)

Rate:

Crop	**Insect**	**mL/ac**	**(L/ha)**
Seedling: potato, corn – sweet, field (both 70)	Cutworms (dark-sided, black and red-backed)	485-970	**(1.2-2.4)**
Seedling: canola, flax (both 21)	Cutworms (variegated, dark-sided, red-backed, pale western, army)	355-485	**(0.875-1.2)**
Seedling: sugar beet (90)	Cutworms (red-backed, pale western)	485-970	**(1.2-2.4)**
Seedling: sunflower (90)	Cutworms (army, red-backed, pale western)	485	**(1.2)**
Foliage: barley, oats, wheat (all 60)	Armyworm (common), cutworms (army, dark-sided, pale western, red-backed)	355-485	**(0.875-1.2)**
Foliage: potato (7)	Potato flea beetle, tarnished plant bug, Colorado potato beetle	405	**(1)**
Foliage: canola (21)	Bertha armyworm, alfalfa looper	305-405	**(0.75-1.0)**
	Common armyworm, grasshoppers	355-405	**(0.875-1.0)**

Notes: 1. Pre-harvest interval (days) given in brackets after crop.
2. Rate range – use low rate for young insects, light infestations or sparse foliage.

Water Volume: Seedling canola and flax – 32-80 L/ac **(80-200 L/ha)** by ground; 4-8 L/ac **(10-20 L/ha)** by air; seedling sugar beet and sunflower 32-80 L/ac **(80-200 L/ha)**; barley, oats and wheat foliage – 20-80 L/ac **(50-200 L/ha)**; potato foliage – 160-325 L/ac **(400-800 L/ha)**; canola foliage – 16 L/ac **(39 L/ha)** by ground, 4 L/ac **(9 L/ha)** by air; all other applications require 80-160 L/ac **(200-400 L/ha)**.

Protective Equipment: Long-sleeved work clothes and gloves when handling and in addition, pesticide respirator and goggles when exposure to spray cannot be avoided.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

6. SPRAYING TIPS: Use the higher rates when the top 1 cm of soil surface is extremely dry or when the infestation is heavy or when foliage is dense. Early evening applications are best. Apply when damage first appears.

7. TOXICITY: Acute oral LD_{50} = 135-163 mg/kg (rat)

8. SAFETY:

Symptoms of poisoning: By inhalation – stuffy, runny nose, scratchy throat, asthmatic wheezing, sudden bronchospasm, swelling of oral and laryngeal mucous membranes, shock.

Toxicological information (for physician): Chlorpyrifos is a cholinesterase inhibitor. Treat symptomatically. Atropine, by injection only, is an antidote.

First aid: IF SWALLOWED – do not induce vomiting. Get medical attention. IF CONTACTED – flush eyes and skin with plenty of water. If in eyes, get medical attention.

9. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. In case of accident call a doctor. May be fatal if swallowed. May be absorbed through the skin. May be irritating to eyes and skin. Avoid contact. Do not wear contaminated clothing. Wash thoroughly after handling. Avoid breathing vapours or spray mist. Keep away from food, feed and water supply. Combustible liquid – keep container closed and away from heat and open flame. Do not contaminate water supply by rinsing equipment or waste disposal.

10. STORAGE: Keep container closed and away from heat and open flame.
Store away from food and feed.

11. DECONTAMINATION AND DISPOSAL: Promptly crush empty containers and bury in locations isolated from water.

13. WHERE AVAILABLE: Alberta Wheat Pool, Oliver Agricultural Supplies, Federated Co-operatives, Cargill Grain, United Grain Growers, Pioneer Grain, Pfizer Chemical Dealers.

Additional information available from:

Dow Chemical of Canada Ltd.
P.O. Box 1012
Sarnia, Ontario
N7T 7K7
Phone: (519)

Dow Chemical of Canada Ltd.
2412 – 10025 Jasper Avenue
Edmonton, Alberta
T5C 1S6
Phone: (403) 428-0440

*******LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE******

MALATHION, CYTHION (malathion)

1. FORMULATIONS: Emulsifiable concentrates – 500E, 500, 50% (500 g malathion/L).
   Grain Protectant – Liquid (1 kg malathion/L)
   Deodorized
   Dust (2% malathion)

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Malathion is a non-systemic, contact, organophosphate insecticide and acaricide of brief to moderate persistence. Generally non-phytotoxic. Not effective below 20°C (does not apply for control of stored grain insects).

4. NUMBER OF APPLICATIONS: Repeat as necessary.

5a. HOW TO APPLY: Emulsifiable Concentrates

With: Ground equipment or aircraft equipment.

Rate:

Crop	**Insect**	**L/ac**	**(L/ha)**
Alfalfa (7), clover (7),	Alfalfa weevil larvae, aphids, grasshoppers, leafhoppers, lygus bugs, spittle bug adults	0.9-1.1	**(2.25-2.75)**
Canola (7), mustard (7)	Flea beetles, grasshoppers	0.45-0.71	**(1.1-1.70)**
	Diamondback moth larvae	0.3	**(0.7)**
Flax (7), pastures (0)	Grasshoppers	0.45-0.71	**(1.1-1.75)**
Cereals (7), hay (7)	Grasshoppers	0.7	**(1.7)**
	English grain aphid,	0.8-1.1	**(2.0-2.8)**
Potato (3)	Aphids, Colorado potato beetle, leafhoppers	0.6-0.8	**(1.5-2.0)**
Sugar beet	Flea beetles	0.45	**(1.1)**
Sweet clover	Sweet clover weevil	0.6-1	**(1.5-2.5)**

Note – 1. **Pre-harvest** or **pre-grazing interval** (days) in brackets following crop.
2. **Rate ranges:** use low rate for immature insects, light infestations or sparse foliage.

Water Volume: For potato pests, use recommended rate in 405 L/ac **(1000 L/ha)** finished spray.

5b. HOW TO APPLY: Grain Protectants

With: Spray or dust application.

Rate:

Insect	**Grain**	**Qty/1000 kg Grain**	
		Liquid	**Dust**
Beetles (confused flour,	Barley	12 mL	**520 g**
	Corn	10 mL	

granary weevil, rice weevil, saw-toothed grain, flat grain, red flour, rusty grain, lesser grain borer), grain mites	Oats	17 mL	**735 g**
	Rye	10 mL	**450 g**
	Wheat	10 mL	**415 g**
Indian meal moth	Barley, corn, oats, rye, wheat	300 mL/100 sq. m of grain surface	

Note – 1. **Stored grain** should not be offered for sale until 7 days after treatment.

Water Volume: For Indian meal moth, use the recommended rate in 5-10 L water. For all other pests, use the recommended rate in 10-20 L water.

Incorporation: Scatter proper amount of dust on each load and cut in with shovel before dumping or add grain as it is being augered.

Protective Equipment: Use a respirator when spraying in closed areas.

6. SPRAYING TIPS:

Alfalfa and clover: apply when about 75% of foliage shows weevil feeding damage. Do not apply when crop is in bloom.

Sugar beet: apply at 3-5 leaf stage when insects or damage first appears.

Sweet clover: spray field margins of first year clover in late summer or early fall when migration of weevil adults is occurring.

All crops: do not apply when bees are present. Apply when day temperature is expected to exceed 20°C.

Stored Grain: to protect from attack by Indian meal moth, apply spray evenly over the surface of clean or uninfested grain and rake to a depth of 15 cm. Apply immediately after grain is loaded into storage. For control of pests in grain on the farm, where special application equipment is not available, any type of low pressure sprayer holding 5 L or more can be used. The spray can be applied to the grain stream as the grain is being elevated into storage. First, test sprayer calibration by discharging into a tank of water, then regulate the flow of grain to get the proper rate of spray. Keep spray coarse to avoid loss as "drift".

Before storing new grain, thoroughly clean up old grain and debris from bins, elevators, or grain handling equipment. Remove and burn all sweepings. After cleaning the premises, apply a residual malathion spray to walls, floors and machinery in grain elevators or farm storage, using a solution containing 200 mL malathion/L water. Make sure the spray is forced into cracks and crevices. Apply at the rate of 5 L of spray per 100 sq. m of surface area using a coarse wetting spray. Wait until spray has thoroughly dried before storing grain in treated areas. This same spray should be applied around the outside of bins and elevators to help prevent re-infestation.

7. GRAZING RESTRICTIONS: Forages and pasture: remove cattle before spraying; cattle may be returned immediately after spraying.

8. TOXICITY: Acute oral LD_{50} = 2800 mg/kg (rat)

9. SAFETY:

Symptoms of poisoning: Headache, weakness, sweating, giddiness, blurred vision, nausea, abdominal cramps, diarrhea, and discomfort in chest.

Toxicological information (for the physician): If accidental poisoning occurs, atropine is antidotal. Pralidoxime chloride (2-PAM; PROTOPAM chloride) may be effective as an adjunct to atropine. For severe cases, administer 4-8 mg of atropine sulfate intravenously at intervals of 10-15 minutes until atropinization is achieved. For less severe cases, administer 2-4 mg intramuscularly at 30 minute intervals. When signs of full atropinization appear, reduce dosage and frequency to 1 mg every 2-4 hours. Full atropinization should be maintained for at least 24 hours from beginning of treatment. For children, administer proportionately lower dosages based on body weight.

First aid: In case of exposure move patient from area and remove contaminated clothing. Wash exposed skin with soap and water. IF IN EYES – flush with water. IF SWALLOWED – and patient is conscious induce vomiting by giving warm salty or soapy water. If breathing is weak or irregular give artificial respiration. Get prompt medical attention.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Hazardous if swallowed, inhaled or absorbed through skin. Avoid breathing spray mist. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling. Remove contaminated clothing.
Do not contaminate food, feed, fertilizers or seed. Do not treat dairy barns. Do not apply to pastures while occupied by dairy animals. Do not treat any plants while in bloom. This product is also toxic to bees exposed to direct treatment or residues on crops. This product is toxic to fish. Do not contaminate any body of water by direct application, cleaning of equipment or disposal of wastes and containers.

11. DECONTAMINATION: Malathion breaks down rapidly in the presence of water and alkaline materials. Containers and spillages can be readily decontaminated by use of Javex or lye, or washing soaps containing sodium hydroxide. Residues of malathion can be buried in a suitable disposal area. First, place a layer of soda ash or hydrated lime at the bottom of a pit, then pour in the malathion, add another layer of soda ash or lime, Finally, cover with a mixture of Javex and water and top with soil. The amount of soda ash or lime and Javex will be dependent upon the amount of malathion to be decontaminated.

12. DISPOSAL: Empty containers may be filled with lye or strong soap solution and left to stand for 24 hours. After washing, dispose of solution in a lime bed. Crush and bury the containers.

13. WHERE AVAILABLE: Almost all pesticide dealers and suppliers carry Malathion EC. Grain companies and Oliver Agricultural Supplies carry grain protectant.

Additional information available from:

Cyanamid of Canada Ltd.
4204 – 109 Street
Edmonton, Alberta
T6J 2S8
Phone: (403) 436-0025

Chipman Inc.
19 Nebraska Road
Lethbridge, Alberta
T1K 3Z6
Phone: (403) 320-1335

METHOXYCHLOR, MARLATE (methoxychlor)

1. FORMULATIONS: Emulsifiable concentrates (EC) – (240 g methoxychlor/L)

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES: Methoxychlor and a fungicide (e.g. captan) for seed treatments.

4. HOW IT WORKS: Methoxychlor is a non-systemic, organochlorine insecticide which works by contact and ingestion. Not for aphids or mites. Short residual.

5. NUMBER OF APPLICATIONS: Repeat as necessary at intervals of 7-10 days (alfalfa and clover with insects other than armyworm, potatoes); 7-14 days (for armyworm on alfalfa, clover, wheat, oats, rye, barley and corn).

6. HOW TO APPLY:

With: Ground or aircraft equipment.

Rates:

Crop	Insect	Formulation	L/ac	(L/ha)
Alfalfa, clover	Alfalfa weevil, sweet clover weevil, flea beetles, leafhoppers, grasshoppers	EC	2.0-2.6	**(5.0-6.3)**
Alfalfa, clover, wheat, corn, oats, barley, rye	Armyworm	EC	2.8-4.9	**(7.0-12.0)**
Potato	Blister beetle Colorado potato beetle, flea beetles, leafhoppers	EC	1.3-4.25	**(3.25-10.5)**

Notes: 1. **Pre-harvest** or **pre-grazing interval** for foliage application is 7 days for crops listed.
2. Rate range – use low rate for immature insects, light infestations or sparse vegetation.

Water Volume: Aerial application – use 12-40 L/ac **(30-100 L/ha)**. Ground application – use sufficient water for good coverage.

Protective Equipment: Clean coveralls, gloves and goggles when handling concentrated product.

7. SPRAYING TIPS: Apply when insects or damage first appears or, for alfalfa weevil, when 60-75% of alfalfa tips show feeding damage. Methoxychlor is the safest insecticide to use on alfalfa seed crops when alfalfa weevil control is necessary during the pollination period. Applications should be made in the late evening.

8. GRAZING RESTRICTIONS: Do not feed treated potatoes or potato refuse to livestock.

9. TOXICITY: Acute oral LD_{50} = 6000 mg/kg (rat)

10. SAFETY:

First Aid: IF SWALLOWED – **do not induce vomiting if product contains petroleum distillate. Read the label.** Otherwise, induce vomiting by taking a tablespoon of salt in a glass of warm water; repeat until vomit fluid is clear. Go to nearest hospital – take the pesticide label.

IF ON SKIN – remove contaminated clothing and wash with soap and water.

IF IN EYES – flush with plenty of water for at least 15 minutes. Get medical attention.

11. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Avoid inhaling mist. Avoid contact with skin, eyes and clothing. Avoid contamination of food and feed. Do not contaminate mangers, drinking troughs or utensils. Wash after using product. Avoid contamination of ponds, lakes, streams or other bodies of water which contain fish or which may be used for irrigation or domestic purposes.

12. STORAGE: If product is exposed to prolonged cold, place in warm storage at 10-20°C for several hours; agitate before using.

13. DISPOSAL: Do not re-use container. Wash out empty containers with water, puncture, crush and bury or take to the dump. Burn empty bags – stay clear of smoke.

14. WHERE AVAILABLE: Green Cross Products, Kemsan (Western) Ltd., Later's Chemicals Ltd., Sanex Chemicals Inc.

Additional information available from:

Chipman Inc.
19 Nebraska Road
Lethbridge, Alberta
T1K 3Z6
Phone: (403) 320-1335

Chipman Inc.
P.O. Box 965
Winnipeg, Manitoba
R3C 2V5
Phone: (204) 786-3421

MONITOR (methamidophos)

1. FORMULATIONS: Solution (480 g methamidophos/L)

2. MARKETING CATEGORY: Restricted – product is to be stored and displayed apart from food or feed.

3. REGISTERED MIXES: Compatible with most commonly used fungicides.

4. HOW IT WORKS: Methamidophos is a broad spectrum organophosphorus insecticide and acaricide which works by contact and systemic action. Non-phytotoxic when used as directed. Contact effectiveness may persist for 7-21 days.

5. NUMBER OF APPLICATIONS: Two per season on canola. Repeat as necessary on potatoes.

6. HOW TO APPLY:

With: Ground or aircraft equipment.

Rate:

Crop	**Insect**	**L/ac**	**(L/ha)**
Canola (10)	Bertha armyworm	0.23-0.51	**(0.575-1.25)**
Potato (14)	Aphids, Colorado potato beetle, potato flea beetle, potato leafhopper	0.71-0.91	**(1.75-2.25)**

Notes: 1. **Pre-harvest interval** (days) given in brackets after crop.
2. **Rate range** – use the high rate for severe infestations, adult insects, or dense foliage.

Water Volume: Ground application – 80-400 L/ac **(200-1000 L/ha)**. Aerial application on canola – use not less than 4 L/ac **(10 L/ha)**.

Protective Equipment: Wear a pesticide mask or respirator, natural rubber gloves, protective clothing and coveralls.

7. APPLICATION TIPS: Apply when insects or damage first appears.
For potato infestations, apply at 10-14 day intervals or as necessary.

8. TOXICITY: Acute oral LD_{50} = 30 mg/kg (rat)

9. SAFETY:

Symptoms of poisoning may include: "tightness" in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea.

Toxicological information (for the physician): The compound inhibits cholinesterase resulting in stimulation of the central nervous system. The antidote is atropine sulfate administered in large therapeutic doses repeated as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine. Do not give morphine. Watch for pulmonary edema which may develop in serious cases of poisoning even after 12 hours. At first sign of pulmonary edema, the patient should be placed in an oxygen tent and treated symptomatically.

First aid: In case of poisoning call a physician immediately. Have patient lie down and keep quiet. IF SWALLOWED – vomiting should be induced. Administer milk or water freely and induce vomiting by giving one dose (15 mL) of syrup of ipecac. If vomiting does not occur within 10-20 minutes, administer second doses. If syrup of ipecac is not available, induce vomiting by sticking finger down throat. Repeat until vomit fluid is clear. The patient should be lying down with head below the foot level and facing down or to one side. Professional medical assistance should be secured immediately. **Do not induce vomiting in an unconscious or convulsive person.**

IF ON SKIN – remove contaminated clothing and wash skin immediately with soap and warm water.

IF IN EYES – flush with plenty of water for at least 15 minutes.

10. PRECAUTIONS:

KEEP OUT OR REACH OF CHILDREN. Do not inhale – Do not get on skin – Do not take internally.

Poisonous if swallowed, inhaled, or absorbed through skin. Rapidly absorbed through skin. Do not get in eyes, on skin or clothing. Wear a mask or respirator of a type suitable for protection against organic phosphate insecticides. Wear natural rubber gloves, protective clothing and goggles. Wash hands, arms and face thoroughly with soap and water before eating or smoking. Wash all contaminated clothing with soap and hot water before reuse. Keep all unprotected persons out of the operating areas or vincity where there may be danger of drift. Vacated areas should not be re-entered until drifting insecticide and volatile residues have dissipated.

Do not apply under conditions involving possible drift to food, forage or other plantings that might be damaged or the crops thereof rendered unfit for sale, use or consumption.

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Toxic to fish and wildlife. Keep out of lakes, streams and ponds. Fish will be killed if their waters are contaminated with this product. Wildlife in contact with treated areas may be harmed. This product is highly toxic to bees exposed to direct treatment or residues on crops. Avoid using during flowering and pollination periods.

Keep pesticide in original container. Do not put concentrate or dilute into food or drink containers.

11. STORAGE: This product is to be stored and displayed apart from food or feed. Do not store in or around the home. Store in a cool, dry place but not below −10°C. Protect from heat.

12. DECONTAMINATION AND DISPOSAL: Rinse empty container three times with clean water, each time adding rinse to spray tank. Puncture and crush empty container, then either burn it – stay away from smoke – or bury it at least 50 cm deep and away from water sources. Never reuse container.

13. WHERE AVAILABLE: Alberta Wheat Pool, Pioneer Grain, Cargill Grain, Oliver Agricultural Supplies, Pfizer Chemical Dealers.

Additional information available from:

Chemagro Ltd.
#203, 610 – 70 Avenue S.E.
Calgary, Alberta
T2H 2J6
Phone: (403) 259-2863

Chemagro Ltd.
1355 Aerowood Drive
Mississauga, Ontario
L4W 1C2
Phone: (416) 625-5280

RIPCORD (cypermethrin)

1. FORMULATIONS: Emulsifiable concentrate – Ripcord 40 EC
(400 g cypermethrin/L)

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Cypermethrin is a synthetic pyrethroid which works by contact and ingestion. It is relatively stable in sunlight.

4. NUMBER OF APPLICATIONS: Repeat as necessary.

5. HOW TO APPLY:

With: Ground equipment only.

Rates:	**Crop**	**Insect**	**mL/ac**	**(mL/ha)**
	Canola (30)	Flea beetles	14-20	**(35-50)**

Notes: 1. **Pre-harvest interval** (days) given in brackets after crop.
2. Use high rate for older insects, severe infestations or dense foliage.

Water Volume: 45 L/ac **(110 L/ha)** minimum
Pressure: 230-300 kPa
Protective Equipment: Wear a hat, cotton coveralls and boots.

6. SPRAYING TIPS: Apply when insects or insect damage first appears.
Early treatment will maximize the repellant activity of cypermethrin. Good crop penetration and coverage is required to achieve satisfactory results, particularly when pests are in lower half of crop. Re-application should be based on pest levels rather than fixed time intervals.

7. TOXICITY: Acute oval LD_{50} is 303 mg/kg (rat)

8. SAFETY:

Symptoms of poisoning: No case of poisoning in man has been reported. Animal experiments suggest that following massive over-exposure or purposeful ingestion, neurological symptoms – ataxia, convulsions, etc. would occur.

Toxicological information (for physician): If poisoning by ingestion is indicated, empty the stomach. Avoid aspiration of solvent into the lungs which could result in chemical pneumonitis. Treat symptomatically.

First aid: Remove contaminated clothing immediately and wash skin with soap and water. IF IN EYES – flush immediately with plenty of clean water.

9. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Avoid exposure to spray mist. Do not contaminate water supply. Highly toxic to bees – do not spray when bees are foraging.

10. STORAGE: Keep product away from excessive heat or open flame.
Do not store near food or feed.

11. DISPOSAL: Product is highly toxic to fish – do not contaminate water supply.

12. WHERE AVAILABLE: Alberta Wheat Pool, United Grain Growers, Pioneer Grain, Federated Co-operatives, Pfizer Chemical Dealers and Green Cross Products Dealers. Additional information available from:

Green Cross Products
820 – 26 Street, N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

Ciba-Geigy Canada Ltd.
6860 Century Avenue
Mississauga, Ontario
L5N 2W5
Phone: (416) 836-9445

SEVIN (carbaryl)

1. FORMULATIONS: Liquid Suspensions – XLR, SL (480 g carbaryl/L).
Wettable Powder – 50W (50% carbaryl).
Sprayable Powder – 80S, (80% carbaryl).

2. MARKETING CATEGORY: Commercial.

3. REGISTERED MIXES: Most formulations are compatible with a wide range of pesticides. Liquid formulations are not compatible with diesel fuel, kerosene, fuel oil or aromatic solvents. All formulations are unstable when mixed with alkaline materials such as Bordeaux, lime-sulphur and casein-lime spreaders.

4. HOW IT WORKS: Carbaryl is a contact and ingestion, carbamate insecticide. Moderate to rapid in speed of action with short to moderate residual effectiveness (2 days to 4 weeks) depending on crop/pest complex, formulation and climatic conditions.

5. NUMBER OF APPLICATIONS: Repeat as necessary.

6. HOW TO APPLY:

With: Ground or aircraft equipment.

Rates:

Crop	**Insect**	**Formulation**	**Qty/ac**	**(Qty/ha)**
Canola[+]	Flea beetles, grasshoppers	XLR, SL	505 mL	(1.25 L)
		or 80S	305 g	(750 g)
Cereals (14): barley, oats, rye, wheat	Grass-hoppers	XLR, SL	0.5-1.0 L	(1.25-2.5 L)
		or 50W	445-910 g	(1.1-2.5 kg)
		or 80S	305-605 g	(0.75-1.5 kg)
Forages (0): alfalfa, clover				
	Blister beetles, leafhoppers	XLR, SL	1.0-1.6 L	(2.5-4.0 L)
		or 50W	0.91-1.32 kg	(2.25-3.25 kg)
		or 80S	605-710 g	(1.5-1.75 kg)
	Alfalfa weevil larvae	50W	1.32 kg	(3.25 kg)
		or 80S	910 g	(2.25 kg)
	Alfalfa caterpillar, armyworm, webworms	XLR, SL	1.0-2.15 L	(2.5-5.25 L)
		or 50W	0.91-1.8 kg	(2.25-4.5 kg)
		or 80S	708-910 g	(1.75-2.25 kg)
	Cutworms (climbing species)	50W	0.91-1.8 kg	(2.25-4.5 kg)
		or 80S	0.6-1.2 kg	(1.5-3.0 kg)
	Sweet clover weevil	50W	0.91-1.8 kg	(2.25-4.5 kg)
		or 80S	605-910 g	(1.5-2.25 kg)
Corn (1): field, sweet	Grass-hoppers	XLR, SL	0.5-1.0 L	(1.25-2.5 L)
	Cutworms (climbing species)	XLR	2.15 L	(5.25 L)
		or 50W	1.8 kg	(4.45 kg)
		or 80S	1.2 kg	(3.0 kg)
	European corn borer, corn earworm, fall armyworm	XLR, SL	1.0-1.6 L	(2.5-4.0 L)
		or 50W	0.91-1.32 kg	(2.25-3.25 kg)
		or 80S	605-910 g	(1.5-2.25 kg)

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

Potato (7)	Cutworms (climbing)	XLR, SL	100-125 ml/300 m row	
		or		
		80S	28.8 g/100 m row	
	Colorado potato beetle	XLR, SL	505 mL	**(1.25 L)**
	Flea beetles, leafhoppers	XLR	505 mL	**(1.25 L)**
	Colorado potato beetle	50W	405 g	**(1 kg)**
	Potato flea beetles, leafhoppers	80S	305-605 g	**(0.75-1.5 kg)**
		or		
		50W	910 g	**(2.25 kg)**
	Fall armyworm	XLR, SL	1.0-2.1 L	**(2.5-5.25 L)**
		or		
		50W	0.91-1.82 kg	**(2.25-4.5 kg)**
	Tarnished plant bug, stink bug	XLR, SL	2.1-2.6 L	**(5.25-6.4 L)**
		or		
		80S	1.2 kg	**(3.0 kg)**
		or		
		50W	1.82-2.23 kg	**(4.5-5.5 kg)**

Notes: 1. **Pre-harvest** or **pre-grazing intervals** (days) given in brackets after crop.
2. **Rate ranges** – use the low rate on immature insects, light infestations or sparse foliage; use the high rate for adult insects, severe infestations or dense foliage.
+ Seedling application only to canola – up to four weeks after emergence.

Water Volume: On all crops, use sufficient water to obtain thorough and uniform coverage (usually between 22-180 L/ac **(55-440 L/ha)** of spray depending on equipment, severity of infestation and stage of crop growth).

Low volume aerial applications: hot, dry conditions may cause excessive evaporation of droplets. A higher spray volume per hectare may be required under hot, dry conditions and when crop canopies are particularly dense. For wash-off resistance with XLR apply at a maximum dilution of 1:11.

Liquids: Use at least 4.0 L/ac **(10 L/ha)** of prepared spray in aerial applications and at least 12 L/ac **(30 L/ha)** of prepared spray for low volume ground applications. For XLR use as low a water volume as possible.

Wettable Powder: Use at least 11-14 L/ac **(28-35 L/ha)** and at least 4.5-14 L/ac **(11-35 L/ha)** of prepared spray for aerial applications.

Climbing cutworms: on corn, use at least 90-120 L/ac **(220-300 L/ha)** with XLR or 80S, or 90-140 L/ac **(220-350 L/ha)** with 50W; on forages and cereals, use at least 227 L/ac **(560 L/ha)** with 50W or 80S.

Nozzles: Low volume applications: For wettable powder, use 50-mesh or coarser screens in entire system; nozzles should be cone type, No. 3 or larger. For XLR, use 50-mesh, in-line strainers and 25-mesh, slotted strainers behind the nozzle; nozzle should be of cone type sizes D6-45 or D8-45. (Flat fan nozzles may be used [sizes 8008-8010] but care should be taken as excessive droplet breakup and resulting production of fine droplets may occur. Flat fan nozzles are also prone to plugging under hot, dry conditions).

Protective Equipment: Wear protective, long-sleeved work clothing. When handling concentrates, also wear goggles and rubber gloves.

7. SPRAYING TIPS: Timing and good coverage are essential for effective control. Apply when insects or damage first appears. For additional information on dates for spraying, consult with your local agriculturalist.

Prepare only as much spray mixture as is needed on the day of mixing. Do not store spray mixtures overnight. Calibrate spray equipment to deliver the required volume.

For all carbaryl formulations, agitate, stir or recirculate prior to use. Remove oil, rust, scale, pesticide residues and other foreign matter from mix tanks and entire spray system.

A dilution of 1:1 (XLR:water) will allow maximum resistance to rainfall or overhead irrigation. Dilution greater than 1:11 are not recommended when wash-off resistance is desired. Avoid applying carbaryl just before rainfall. Spray droplets must dry on the foilage to have wash-off resistance. Under low humidity, at least one 1 hr drying is adequate. Wash-off resistance cannot be expected when XLR is applied to wet foilage which does not dry before rainfall.

Corn – for larvae in whorls and for foliage feeders, treat entire plant. For climbing cutworms, spray in a 25-30 cm band over the row. For insects attacking silks and ears, apply, if necessary, at 2-4 day intervals; start when first silks appear and continue until silks begin to dry. Three or more applications may be required depending on the severity of the infestation.

Forages and Cereals – repeat applications at 7-14 day intervals, if necessary.

Grasshoppers – on pasture, rangeland and associated borders, use XLR formulation at 485-930 ml/ac **(1.2-2.3 L/ha)** for nymphs or on sparse vegetation, or 0.95-1.4 L/ac **(2.3-3.5 L/ha)** for adults or dense vegetation.

Alfalfa Weevil – if pre-treatment damage is extensive, cut and make application to stubble.

8. GRAZING RESTRICTIONS: Remove cattle from area to be sprayed.
Cattle may graze immediately after application. Treated forage and feed crops may be fed to dairy animals and animals being finished for slaughter provided sprays are applied as directed.

9. TOXICITY: Acute oral LD_{50} = 540 mg/kg (rat)

10. SAFETY:

Symptoms of poisoning may include: salivation, lacrimation, urination, defication, pinpoint pupils, muscle spasms, general muscular weakness, nausea, prostration, convulsions.

Toxicological information (for the physician): Carbaryl insecticide is a moderate, reversible, cholinesterase inhibitor. Atropine is antidotal. Do not use 2-PAM, opiates or cholinesterase-inhibiting drugs.

First aid: For skin and eye contact – flush with water. Contact a physician immediately and go to a physician as quickly as possible. In case of emergency, phone collect (24 hours a day) 1-(514)-645-5311.

11. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Do not inhale spray. Wear regular, long-sleeved, work clothes. Change clothing daily. Wash hands and face before eating or smoking; wash thoroughly at end of day. Treated areas may be entered immediately after spray has dried.

Carbaryl is low in toxicity to fish, wild birds and poultry but highly toxic to honey bees exposed to direct treatment or, for some formulations, to residue. XLR is less hazardous to honey bees than other carbaryl products and the following precautionary measures may be discontinued after spray has dried: (i) do not apply when bees are foraging, (ii) confine bees to hive, or relocate hives to safe area while spraying.

12. STORAGE: Store unused carbaryl formulation in original container only, in a cool, dry area out of reach of children and animals. Do not store where temperature frequently exceeds 38°C. All formulations will withstand freezing.
Do not contaminate water, food or feed by storage or disposal.

13. DECONTAMINATION AND DISPOSAL: Dispose of unused pesticide, spray mixture or rinse in landfill approved for pesticides or bury in a safe place away from water supplies.

Decontaminate empty bulk tanks and drums with water rinses. Do not reuse empty plastic drums or drum liners. Recondition metal drums before reuse. Destroy containers by burying in approved landfill or other safe place.

14. WHERE AVAILABLE: Alberta Wheat Pool, Green Cross Products, Oliver Agricultural Supplies, Pfizer Agricultural Division, U.F.A. Co-op Ltd.

Additional information available from:

Union Carbide Agricultural
Products Co. Ltd.
P.O. Box 1198
Chathan, Ontario
N7M 5L8
Phone: (579) 351-0400

B. Hutton
Union Carbide Ag. Products
Carman, Manitoba
R0G 0J0
Phone: (204) 745-3087

SUPRACIDE (methidathion)

1. FORMULATIONS: Emulsifiable concentrate (250 g methidathion/L)

2. MARKETING CATEGORY: Restricted

3. REGISTERED MIXES: None. Supracide is compatible with many fungicides.

4. HOW IT WORKS: Methidathion is a non-systemic organophosphate insecticide with some acaricidal activity. It works by contact and stomach action, is non-phytotoxic at the recommended rates and penetrates foliage. Residual activity is dependent upon the crop and pest.

5. NUMBER OF APPLICATIONS: Repeat as necessary.

6. HOW TO APPLY:

With: Ground or aircraft equipment.

Rate:

Crop	Insect	L/ac	(L/ha)
Alfalfa (10)	Alfalfa weevil, leafhoppers, lygus bugs, pea aphid	0.45-0.91	**(1.1-2.25)**
Canola (30) mustard	Flea beetles	0.3	**(0.7)**
	Diamond-back moth, red turnip beetle	0.41	**(1.0)**
Potato (14)	Colorado potato beetle, flea beetles, potato leafhoppers, tarnished plant bug	0.45	**(1.1)**
Sunflower (50)	Painted lady butterfly, sunflower maggot, sunflower moth	0.85-1.1	**(2.1-2.8)**

Notes: 1. **Pre-harvest interval** (days) given in brackets after crop.
2. **Rate range** – use the high rate for severe infestation, adult insects, or dense foliage.

Water Volume: Ground equipment – 45 L/ac **(110 L/ha)**; aircraft application – 9 L/ac **(22 L/ha)** or 4.5-9.0 L/ac **(11-22 L/ha)** for potatoes.

Protective Equipment: Pesticide respirator and goggles when spray mist cannot be avoided. Coveralls.

7. APPLICATION TIPS: Apply to alfalfa when insects or damage first appears or when 20-30% of stems have tip damage by alfalfa weevil. Repeat application as necessary or, for potatoes, at 7 day intervals (exception: flea beetles and potato beetles at 10-15 day intervals).

   Thorough coverage of foliage is essential. Do not apply when rain is imminent.

8. GRAZING AND CROPPING RESTRICTIONS: Do not harvest alfalfa for feed or hay or allow livestock to graze within 10 days of application. Do not feed or allow livestock to graze on treated canola, mustard or sunflower.

9. TOXICITY: Acute oral LD_{50} = 65 mg/kg (rat).

10. SAFETY:

    Symptoms of poisoning: Typical organophosphate poisoning symptoms are: headache, dizziness, blurred vision, weakness, nausea, cramps, diarrhea, discomfort in chest, sweating, salivation, pulmonary edema, cyanosis, uncontrollable muscle twitches, loss of reflexes, convulsions, coma.

Toxicological information (for the physician): Methidathion is a cholinesterase inhibitor. Atropine is antidotal provided it is administered as soon as early poisoning symptoms appear and the dose of methidathion is not too great. It is important to give large doses of atropine, up to 10 times the usual amount.

Poison Control Centres: 1-(403)-474-3431
1-(403)-432-8410

First aid: IF SWALLOWED – induce vomiting and get immediate medical attention.

IF IN EYES – flush with plenty of water for at least 15 minutes and get medical attention.

IF ON SKIN – wash with soap and water.

11. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Harmful or fatal if swallowed. Causes eye damage and skin irritation. Do not get in eyes, on skin or clothing. Wear goggles or face shield and rubber gloves when mixing. Do not breathe spray mist (inhalation of spray mist may be harmful). Wear an approved respirator during prolonged use. Do not enter treated fields on the day of application. Wear adequate clothing during the preparation of spray mixture, during application and when entering treated fields. Wash thoroughly before eating and at the end of the work period. Change clothing daily. Keep out of reach of domestic animals. Do not use or store in or around the home.

Product is toxic to fish, birds and other wildlife. Keep out of any body of water. Do not apply where run-off is likely to occur. Do not apply when the weather conditions favor drift from treated areas. To avoid injury to pollinating insects do not apply during bloom. A minimum 3 day re-entry period for foraging bees should be observed.

12. STORAGE: Do not use or store in or around the home. This product is to be stored or displayed apart from food or feed. Store at temperatures above 0°C. Do not use or store near heat or open flame.

13. DECONTAMINATION AND DISPOSAL: Rinse empty container 3 times with clean water, each time adding rinse to spray tank. Puncture and crush empty container and either burn it – stay clear of smoke – or bury it at least 50 cm deep and away from water supply.

14. WHERE AVAILABLE: Alberta Wheat Pool, United Grain Growers, Pioneer Grain, Federated Co-operatives, Pfizer Chemical Dealers, Green Cross Products Dealers.

Additional information available from:

Ciba-Geigy Cananda Ltd.
6860 Century Avenue
Mississauga, Ontario
L5N 2W5
Phone: (416) 836-9445

Green Cross Products
820 – 26 Street N.E.
Calgary, Alberta
T2A 2M4
Phone: (403) 273-5656

TEMIK (aldicarb)

1. FORMULATIONS: Granular – Temik 10G (10% aldicarb)
2. MARKETING CATEGORY: Restricted
3. REGISTERED MIXES: Compatible with most fertilizers or pesticides. Do not use with alkaline materials such as lime.
4. HOW IT WORKS: Aldicarb is a soil-applied, systemic, carbamate insecticide. Soil moisture is required to release the active chemical from the granules (corn cob grits) so irrigation or rainfall should follow application. Uptake by roots is rapid; residual activity varies with dosage and pests involved but often lasts more than 6 weeks.
5. NUMBER OF APPLICATIONS: One application per year for field crops.
6. HOW TO APPLY:

With: Ground equipment.

Rate:

Crop	Insect	kg/ac	(kg/ha)
Potato	Flea beetle, Colorado potato beetle, leafhoppers	9.1	(22.5) or 200 g/100 m row
	Aphids	4.5	(11) or 100 g/100 m row
Sugar beet	Sugar beet root maggot	4.5	(11) or 100 g/100 m row

Incorporation: Furrow Treatment – Apply granules with seed in the planting furrow and cover with soil.
Band Treatment – At planting, apply granules in a 20 cm wide band and work into the soil or cover with soil to a depth of 10 cm. Plant seed pieces in the treated zone.
Side Dressing – At post-emergence, drill granules at a depth of 8-20 cm (usually 2.5-5 cm below the seed pieces) on both sides of the row, 5-10 cm from the row.

Protective Equipment: Wear protective long-sleeved clothing, goggles, respirator mask, and rubber gloves when handling.

7. APPLICATION TIPS: Do not apply to very dry soil unless treatment is followed by irrigation. Calibrate and adjust application equipment to insure proper rate and accurate placement.
8. RESTRICTIONS: Do not harvest potatoes or sugar beets within 90 days of application. Do not harvest sugar beet tops for livestock feed within 120 days of application. Do not use tops from treated beets as food for humans. Do not use plant parts for food or feed. Do not plant food crops in soil treated with this product for at least 1 year after treatment.
9. TOXICITY: Acute oral LD_{50} = 0.6 mg/kg (rat)
10. SAFETY AND PRECAUTIONS:

Symptoms of poisoning may include: weakness, headache, sweating, nausea, vomiting, diarrhea, tightness in chest, blurred vision, pinpoint pupils, abnormal flow of saliva, abdominal cramps, unconsciousness. Contact a physician immediately in all cases of suspected poisoning.

Toxicological information (for the physician): This product is a carbamate pesticide containing 2-methyl-2-(methylthio) propionaldehyde 0-(methylcarbamoyl) oxime. It is a spontaneously reversible cholinesterase inhibitor causing parasympathetic nerve stimulation. Preferred treatment of poisoning is atropine sulphate given intravaneously. As much as 2-4 mg may be needed every 10-12 minutes until patient is fully atropinized. Dosage for children is appropriately reduced. Atropinization should be maintained for 12 hours by intramuscular administration of atropine in lower doses given at appropriate time intervals. Do not use opiates or cholinesterase-inhibiting drugs. Artificial respiration or oxygen may be necessary. Observe patient continuously for at least 24 hours. Allow no further exposure to any cholinesterase inhibitor until cholinesterase is regenerated and the level is normal by blood test.

First aid: IF ON SKIN – wash immediately and thoroughly with soap and water and rinse well.

IF IN EYES – flush with plenty of water for 15 minutes.

IF SWALLOWED – cause vomiting immediately by putting finger down throat. Follow with plain water, and repeat until vomit fluid is clear. **Do not induce vomiting or give anything by mouth to an unconscious person. Start artificial respiration immediately if patient is not breathing.** If symptoms are apparent and person is conscious, administer atropine sulphate tablets by mouth as directed by the physician (two 0.6 mg tablets is the usual dose). Call a physician or transport patient to the nearest hospital or physician, whichever is faster. Show a copy of the label to the physician.

In case of emergency, telephone collect 24 hours a day 1-(514)-645-5311.

11. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Harmful or fatal if swallowed, inhaled or absorbed through the skin. Rapidly absorbed through the skin and eyes. Do not handle with bare hands. Avoid contact with skin, eyes and clothing. Do not breathe dust. Wear protective, long-sleeved clothing, goggles, respirator mask and rubber gloves when handling. Wash hands and face before eating or smoking during work hours. After work, wash entire body with soap and water. Wash contaminated clothing and protective equipment in a strong solution of washing soda and rinse thoroughly before wearing again. Clean application equipment thoroughly after use.

Toxic to fish, birds and wildlife. Deep disc spills at row ends immediately to prevent birds from feeding on exposed granules. Do not contaminate any body of water. Do not mix granules directly with water. Do not use applicators that would grind granules. Do not apply to open blooms. Do not use in home garden.

12. STORAGE: Do not store in or around the home. Do not store or display near food or feed. Store indoors in an isolated, well-ventilated, clean, dry, cool area. Do not refrigerate.

13. DECONTAMINATION AND DISPOSAL: Dispose of empty containers by delivering them to an approved landfill site for burial. Do not burn. If carton is broken, handle with rubber gloves.

If spill occurs on floor areas, use a sweeping compound to clean up. Decontaminate the waste with a solution of caustic soda, a strong commercial bleach and detergent. Wash floor with the decontamination solution and rinse well with clean water. Clean up the solution and rinse water with absorbent material such as sawdust, sweeping compound or rags. Dispose of waste and rinsings by burying in a non-crop, non-graze area away from all water supplies.

If spill occurs on the ground, collect the material and dispose of it as above. Treat the affected area with the decontamination solution and cover with clean soil.

Decontamination Solution – Into 10 L of water, slowly and carefully add in sequence 130 g detergent, followed by 525 g caustic soda (lye) and finally 1.2 L of commercial bleach (sodium hypochlorite). Handle and use the solution with great care. Do NOT add water to dry lye.

14. WHERE AVAILABLE: Pfizer Chemical Dealers, Oliver Agricultural Supply.

Additional information available from:

Union Carbide Agricultural Products Co., Inc.
472 Riverview Drive
Chatham, Ontario
N7M 5L8
Phone: ( )

THIODAN (endosulfan)

1. FORMULATIONS: Emulsifiable concentrate (400 g endosulfan/L)
   Wettable powder (50% endosulfan by weight)

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES: Endosulfan is compatible with most insecticides and fungicides except Bordeaux mixture, hydrated lime, calcium arsenate or zinc sulfate.

4. HOW IT WORKS: Endosulfan is a non-systemic, organochloride insecticide/acaricide with both contact and stomach action. The molecule binds to a portion of the nerve membrane and interferes with ion transfer. The ion transfer imbalance sustains a repetitive nerve discharge, eventually resulting in total paralysis and death.

5. NUMBER OF APPLICATIONS: Repeat as necessary except for corn (sweet and field – not more than twice per season) and sugar beet (not more than once).

6. HOW TO APPLY:

With: Ground or aircraft equipment.

Rates:	**Crop**	**Insect**	**Formulation**	**Qty/ac**	**(Qty/ha)**
	Alfalfa (30) clover (30)	Spittle bugs	EC	0.3 L	**(0.75 L)**
	Alfalfa seed	Aphids	EC	0.6 L	**(1.5 L)**
		Lygus bugs		1.8-2.2 L	**(4.5-5.5 L)**
	Corn (50)	Corn leaf aphid	EC or WP	1.1 L 0.91 kg	**(2.75 L)** **(2.25 kg)**
	Corn (50)	Corn earworm	EC or WP	1.1-1.7 L 0.9-1.3 kg	**(2.75-4.25 L)** **(2.25-3.25 kg)**
	Potato (0)	Aphids, Colorado potato beetle, flea beetles, leafhoppers, tuber flea beetles	EC	0.6 L 0.45 kg	**(1.5 L)** **or** **(1.1 kg)**
	Sugar beets (45)	Green peach aphid	EC	0.6 L	**(1.5 L)**
		Beet webworm	EC	1.1 L	**(2.75 L)**

Notes: 1. **Pre-harvest** or **pre-grazing intervals** (days) given in brackets after crop.
2. **Rate range** – use the lower rate for young insects (larvae), light infestations or sparse foliage.

Water Volume: Thorough wetting of all plant parts is essential for good results.

Protective Equipment: Wear clean, synthetic rubber gloves, goggles and respirator.

7. SPRAYING TIPS: Mixing WP – fill spray tank nearly full and either pour recommended amount on water surface or premix powder in a bucket half-filled with water then pour mix through screen into nearly filled spray tank. Finish filling tank. Keep agitator running during filling and spraying. Spray upper and lower leaf surfaces.

8. GRAZING AND CROPPING RESTRICTIONS: Do not feed treated crop refuse (vines, tops, stocks or threshings) or sugar beet foliage to livestock. Sugar beet roots may be fed. Do not ensile treated corn. Do not graze treated green crops except for alfalfa and clover which should not be foraged within 30 days of application. Succeeding crops – Do not apply to crops which are to be followed by a root crop other than carrots, potatoes, sweet potatoes or sugar beets.

9. TOXICITY: Acute oral LD_{50} = 80-110 mg/kg (rat)

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

10. SAFETY:

Symptoms of poisoning: Nausea, headaches, general feeling of being unwell, followed by generalized convulsion.

Toxicological information (for the physician): Endosulfan is a central nervous system stimulant. There is no specific antidote. If patient is convulsing, give amobarbital-sodium or thiopental-sodium intravenously. Otherwise phenobarbital (0.06-0.10 gram) may be given orally. Do not use oil laxatives as they increase absorption. Do not give stimulants. Patient should be under medical observation for at least 24 hours in any case of suspected intoxication. Electroencephalogram may show abnormal alpha-wave activity.

First aid: Wettable Powder and Dust: IF SWALLOWED – if patient is conscious, induce vomiting by giving patient one to two glasses of water and inserting a finger down the throat; repeat until vomit fluid is clear. If breathing is weak or irregular give artificial respiration. Get prompt medical attention bringing the labelled container with you. Do not give stimulants.

Emulsifiable Concentrate: IF SWALLOWED – Do NOT induce vomiting and avoid breathing vomitus into the lungs. Product contains petroleum distillates.

IF IN EYES – flush with plenty of water for 15 minutes and go to nearest hospital at once.

IF ON SKIN – remove contaminated clothing and wash skin thoroughly with soap and water.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Poisonous if swallowed, inhaled or absorbed through the skin. Avoid breathing spray mist or dust. Avoid contact with skin, eyes or clothing. Wear goggles, respirator, coveralls and synthetic rubber gloves when mixing or loading or when spray mist cannot be avoided. Wash with soap and water before eating, drinking or smoking. Change to clean clothing and wash contaminated clothing before reuse.

Do not contaminate any body of water. Do not apply or allow to drift to areas occupied by unprotected persons or animals. Do not contaminate feed or food. Highly toxic to fish. Moderately toxic to bees.

12. STORAGE: Do not store E.C. below –7°C. Do not store near foodstuffs, feed, fertilizers, seed or like commodities. Do not store in or around the home.

13. DECONTAMINATION AND DISPOSAL: For spilled powder, spread with sawdust or dirt to prevent scattering. Apply sodium carbonate, caustic soda or hydrated lime on contaminated area. After one hour collect with a shovel or a broom and wash paved areas with water. For spilled liquid, decontaminate with any of above alkaline chemicals and allow to stand for one hour. Apply sawdust, talc, or sand to absorb all liquid. Decontaminate tools with hydrated lime. Bury unusable or clean-up product 50 cm deep in an isolated area away from any water supply. Powder removed from the site without decontamination must be decontaminated while being buried by alternating layers of caustic soda or lime with endosulfan powder. When burying with clean-up absorbents from liquid spills, apply a layer of soda, caustic or lime on the top before filling the hole. Crush or puncture empty containers and bury 50 cm deep away from any water supply or take to the garbage dump.

14. WHERE AVAILABLE: Niagara Chemical, Pfizer Dealers, Chipman Inc., Oliver Agricultural Supplies, Federated Co-op and most grain companies.

Additional information available from:

Hoechst Canada Inc.
295 Henderson Drive
Regina, Saskatchewan
S4N 6C2
Phone: (306) 924-1500

Pfizer Chemicals & Genetics
9515 Academy Drive S.E.
Calgary, Alberta
T2J 1A6
Phone: (403) 259-5805

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CHEMICAL CONTROL OF PLANT DISEASES IN ALBERTA

Introduction

Plants, like other living organisms, are attacked by many diseases that are caused by fungi, bacteria, viruses, mycoplasmas and nematodes. The management of plant diseases is based on four general parameters that include:

a) *Exclusion* or quarantine, i.e. prevention of a disease organism or diseased plant material from entering a country or disease-free area where the disease could become established;

b) *Protection* whereby proper sanitation practices, chemical controls, adequate soil nutrient levels and good soil drainage may be used to protect plants from disease organisms;

c) *Eradication* involving the use of crop rotations or the application of eradicant chemicals such as fungicides; and

d) *Plant breeding* whereby crop plants are selected for partial or complete resistance to a specific disease or range of infectious diseases.

In Alberta, fungal diseases of field crops may be subject to direct chemical control by fungicides whereas control of other diseases rely on alternate methods. The major use of fungicides in these crops at present is in the treatment of seeds (cereal, forage, oilseed) and potato seed pieces. Except for canola and field beans, foliar fungicides are not generally registered, available or economically feasible at the present time. For convenience, dual purpose treatments with the insecticide Lindane, used in seed-treatment formulations, have been included in this chapter on fungicides.

The principles and procedures involving the use of plant disease control chemicals follow the guidelines outlined for chemical weed control in the first chapter of this manual.

BENLATE (benomyl)

1. FORMULATIONS: Wettable Powder – Benlate (50% benomyl)
2. MARKETING CATEGORY: Commercial
3. REGISTERED MIXES: With fungicides, captan and thiram. Dual purpose formulations with insecticide, lindane. Do not mix with alkaline pesticides such as basic copper sulphate, Bordeaux mixture or lime sulphur.
4. HOW IT WORKS: Benomyl is a protective and eradicant fungicide with systemic activity; effective against a wide variety of fungi and mites.
5. NUMBER OF APPLICATIONS: One per season.
6. HOW TO APPLY:

With: Ground or aircraft equipment.

Rate:

Crop	**Disease**	**g/ac**	**(kg/ha)**
Beans, (dry, white, snap, common) (14)	Sclerotinia (white mould), botrytis (gray mould)	710-910	(1.75-2.25)
Canola	Sclerotinia (stem rot)	405-605	(1.0-1.5)

Notes: 1. **Pre-harvest interval** (days) given in brackets after crop.
2. **Rate range** – use the high rate under severe disease conditions.

Water Volume: Beans – 1000 L water/500 g product.
Canola – minimum 16 L water/ac **(40 L/ha)**.

7. SPRAYING TIPS: Beans – apply between 50 and 100% bloom; obtain thorough coverage. Under high humidity conditions when crop canopy favors high yields, a split application may be necessary. Canola – apply between 20 and 30% bloom; obtain thorough coverage.

   Continuous agitation is required to keep the material in suspension. Do not apply when rain is imminent; do not irrigate within six hours of application.

8. GRAZING RESTRICTIONS: Do not graze or feed treated bean hay to livestock.
9. TOXICITY: Acute oral LD_{50} is greater than 10,000 mg/kg (rat).
10. SAFETY:

    Symptoms of poisoning: product may irritate eyes, nose, throat and skin.

    First aid: IF ON SKIN or IF IN EYES – flush with plenty of water. Get medical attention for the eyes.

11. PRECAUTIONS: Keep out of reach of children. Avoid breathing dust or spray mist. Avoid contact with skin, eyes and clothing. Keep away from fire or sparks.

    Product is toxic to fish. Do not contaminate lakes, streams or ponds. Do not apply when weather conditions favor drift from treated areas. Do not contaminate water by cleaning of equipment or disposal of wastes.

12. STORAGE: Never allow product to become wet during storage – reduced fungicidal effectiveness may result. Keep container closed when not in use.
13. DISPOSAL: Do not reuse container; burn when empty.
14. WHERE AVAILABLE: United Farmers of Alberta Co-op (also: elevators, independent dealers and some aerial applicators).

    Additional information available from:

    DuPont Canada Inc.
    2412 – 10025 Jasper Avenue
    Edmonton, Alberta
    T5C 1S6
    Phone: (403) 428-0440

DUAL PURPOSE FORMULATIONS
BENOMYL : CAPTAN : LINDANE

1. FORMULATIONS: Dust – Gammasan + (6% : 10% : 50%)

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Benomyl is a systemic fungicide that protects against blackleg. Captan is a fungicide that protects young plants against rots and damping-off. Lindane is an organochlorine insecticide which acts by ingestion, contact and, to a lesser extent, by fumigant action against a wide variety of soil-dwelling and phytophagous insects.

4. HOW TO APPLY:

With: Seed-dressing equipment.

Rate:

Crop	**Diseases and Insects**	**g/25 kg seed**
Canola	Blackleg, damping-off, flea beetles	775-1550

Notes
- Use the high rate in areas of heavy flea beetle infestation (generally only produced by successive cropping of flea beetle-susceptible crops on the same or immediately adjacent areas).
- This treatment provides flea beetle protection during germination and early emergence only.
- For high rate, use 150 mL mineral oil or linseed oil as a sticker per 25 kg seed. First churn or mix the seed and oil then add powder and mix again. The high rate should be used only with planting equipment that can be adjusted to compensate for the increased coating on the seed.

Protective Equipment: Wear a properly designed dust mask and goggles. Change filters frequently while treating seed. Keep away or upwind from dust.

5. APPLICATION TIPS: Pre-seeding treatment – the preferred method of application for best results. Treat seed in an end-over-end drum-type seed treater or a cement mixer.

Drill box Treatment (follow directions carefully misapplication may result in drill plugging). When starting with an empty planter box, treat enough seed in a separate container to cover bottom of planter box. Mix powder and seed thoroughly until seed is a uniform white by either of the following methods.

(i) Place and level one-half of the seed in drill or planter box and sprinkle uniformly over surface of the seed one-half the powder required for the full planter box. Mix thoroughly with a stick or paddle, then fill the box with seed and sprinkle the remaining one-half of the powder over the seed and mix again until seed is a uniform white. **Do not mix with hands.**

OR

(ii) Dribble 775 g of powder into each 25 kg of seed as it is poured into the drill box. Thoroughly mix with a lath or paddle when the drill box is one-half full and again when full until seed is a uniform white. **Do not mix with hands.**

6. TOXICITY: Acute oral LD_{50} (rat) = benomyl (10,000), captan (9,000), lindane (88).

7. SAFETY:

Symptoms of poisoning: Lindane – nausea, vomiting, hyper-irritability, convulsions, coma, and other symptoms typical of organochlorine insecticide poisoning. Skin contact with fungicides may result in irritation and dermatitis.

Toxicological information (for the physician): Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline.

First aid: IF SWALLOWED – cause vomiting by sticking finger down throat or swallowing syrup of ipecac, then give a laxative such as epsom salts. Get medical attention. Avoid liquid petrolatum and castor oil. IF IN EYES – flush with plenty of water. IF ON SKIN – wash with soap and water.

8. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Poisonous if swallowed, inhaled or absorbed through the skin. Wash thoroughly after handling or using and before eating or smoking. Wash contaminated clothing before re-use. Do not use on seeds other than those listed on the label. Gammasan+ is unsuitable for other crops. Do not contaminate ponds, lakes or streams. Do not contaminate food or feed. Bury empty containers. Lindane is toxic to fish, birds and other wildlife.

9. STORAGE: Do not store in or around the home. Do not store near food or feed. Never allow product to become wet during storage (this may lead to chemical changes which will reduce the effectiveness of the benomyl fungicide). Keep container closed when not in use. Dry treated seed may be stored for several months. Oil-dressed seed should be sown within one week of treating to avoid shedding of treatment. Label all unplanted, treated seed as follows: "Poisonous to man and animals. This seed has been treated with captan and benomyl fungicides and lindane insecticide for the control of diseases and insects. Do not use as food or feed. Do not sell to oil mills".

10. WHERE AVAILABLE: Cargill Grain, Later's Chemical Ltd., Oliver Agricultural Supplies, Westcan Horticultural Specialists Ltd.

Additional information available from:

Chipman Inc.
Box 836
4605 – 101 Avenue
Edmonton, Alberta
T5H 2L4
Phone: (403) 465-5849

DUAL PURPOSE FORMULATIONS
BENOMYL : THIRAM : LINDANE

1. FORMULATIONS: Dusts – Benolin R (6% : 10% : 50%)
   - Thiralin Plus (6% : 10% : 75%)

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Benomyl is a systemic fungicide that protects against blackleg. Thiram is a fungicide that protects against seed-borne diseases. Lindane is an organochlorine insecticide that acts by ingestion, contact and, to a lesser extent, by fumigant action against a wide variety of soil-dwelling and phytophagous insects.

4. HOW TO APPLY:

With: Seed-dressing equipment.

Rate:

Crop	**Diseases and Insects**	**kg/100 kg seed**
Canola	Blackleg, damping-off, seedling decay, seedling blight, flea beetles	3

Protective Equipment: Dust mask, goggles, gloves.

5. APPLICATION TIPS: Seed to be treated with Benolin R may be treated first with canola or vegetable oil (135 mL/100 kg seed) to improve contact between seed and product. Thiralin Plus has an added adhesive. When starting with an empty planter box, first cover the planter box bottom with treated seed (mixed in a separate container) to ensure that first seeds sown are adequately treated. Then fill the drill or planter box half-full and sprinkle half the amount of powder required for the full box over the seed. Mix thoroughly with a stick or paddle until the seed is a uniform white. Add enough seed to fill the box, cover with the remaining powder and mix again. For large boxes, it may be necessary to divide the seed into several portions. As an alternate method, use a commercial drum or auger, dust seed-treater or a cement mixer. Clean planter plates periodically to prevent excessive build-up of treatment chemicals. **Do not mix with bare hands.** Under certain circumstances, for example, if excessive oil is added, the seed may bridge in the seed drill. Check the seed drill calibration before and during seeding operation.

6. GRAZING AND CROPPING RESTRICTIONS: Do not use on soil in which edible root crops (except rutabagas and turnips) are to be planted in the same or following season.

7. TOXICITY: Acute oral LD_{50} in mg/kg: benomyl (10,000), thiram (375), lindane (88), Thiralin-Plus (40-200).

8. SAFETY:

   Symptoms of poisoning: Lindane – nausea, vomiting, hyper-irritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis. Consumption of alcohol 24 hours before or after working with thiram may cause sweating, flushing, headache and nausea.

   Toxicological information (for the physician): Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline. Thiram has no specific antidote. If swallowed – induce vomiting with syrup of ipecac or intubate the stomach. If reaction with alcohol occurs, treat as disulfiram-alcohol reaction.

   First aid: IF SWALLOWED – induce vomiting by giving syrup of ipecac (adult dosage 30 mL; child under 12 years 15 mL) followed by water to enhance vomiting. Use mustard or salt in warm water if syrup of ipecac not available. Keep patient quiet. Seek medical attention immediately. IF ON SKIN – wash promptly with warm water and soap. IF IN EYES – flush immediately with running water. Seek medical attention.

9. PRECAUTIONS:

   KEEP OUT OF REACH OF CHILDREN. Work in a well ventilated area and wear a suitable dust mask, goggles and gloves. Do not handle product or treated seed with bare hands. Keep package or dust away from sparks or flame. Do not get in eyes. Avoid contact with skin. Avoid consumption of alcohol 24 hours before and after working with product or treated seed. Do not contaminate food or feed. Do not contaminate any water supply.

10. STORAGE: Do not store in or around the home. Do not store near food or feed. Never allow product to become wet during storage (this may lead to chemical changes which will reduce the fungicide effectiveness). Keep container closed when not in use. Do not re-use container; bury when empty. Dry, treated seed may be stored several months. Canola or vegetable oil-dressed seed should be sown within one week of treating to avoid shedding of treatment. Label all treated, stored seed as: "Poisonous to man and animals. This seed has been treated with benomyl and thiram fungicides and lindane insecticide for the control of diseases and insects. Do not use as food or feed. Do not sell to oil mills."

10. WHERE AVAILABLE: Co-op Farm Supply Centers, Niagara Chemical.

Additional information available from:

Federated Co-operatives Ltd.
Box 1050
Saskatoon, Saskatchewan
S7K 3M9
Phone: (806) 224-3208

CARBATHIIN

1. FORMULATIONS: Vitavax Seed Treatment
Solutions (SN) – 23.3% carbathiin
– 18.4% carbathiin

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES: With fungicides – Vitavax powder (carbathiin 26:7 : thiram 38.8); Vitaflo-280 (carbathiin 14.9 : thiram 13.2); Pro-gro (carbathiin 30 : thiram 50); Vitavax-captan 30W (carbathiin 6 : captan 24). Dual purpose formulations (with insecticide) – Vitavax rs flowable (carbathiin 3.3 : thiram 6.6 : lindane 49.9); Vitavax rs powder (carbathiin 3.3 : thiram 6.7 : lindane 50.0); Vitavax dual powder (carbathiin 20.0 : thiram 28.9 : lindane 18.7); Vitavax dual solution (carbathiin 16.9 : lindane 15.7).

4. HOW IT WORKS: Carbathiin is a systemic fungicide which penetrates the seed coat to control disease.

5. NUMBER OF APPLICATIONS: One, applied up to 8 months prior to seeding.

6. HOW TO APPLY:

With: On-farm treatment – through the auger with special equipment or with an inexpensive pump or dripolator device; or, may be applied at seed cleaning plant.

Rate:

Crop	Diseases	mL/100 kg seed
Barley	Smuts (covered, false loose, true loose)	240 (23.3% SN) or 300 (18.4% SN)
Flax	Damping-off, seed decay	400 (23.3% SN)
Oats	Smuts (loose, covered)	320 (23.3% SN) or 415 (18.4% SN)
Rye	Stem smut	200 (23.3% SN)
Wheat	Smuts (true loose, stinking)	240 (23.3% SN) or 290 (18.4% SN)

Protective Equipment: Wear a suitable dust mask, goggles and gloves.

7. GRAZING RESTRICTIONS: Treated seed should not be used as feed.
Do not graze or feed livestock on treated areas for 4 weeks after planting.

8. TOXICITY: Acute oral LD_{50} = 7066 mg/kg (rat)

9. SAFETY:

First aid: IF SWALLOWED – induce vomiting by giving 15 mL salt, mustard or soap in a glass of warm water. Repeat until vomit fluid is clear. Keep patient quiet. Obtain medical attention. IF IN EYES – flush immediately with running water for 15 minutes. IF ON SKIN – wash with warm water and pumice soap.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Do not get in eyes or on skin. Work in well ventilated area. When treating seed, augering or handling treated seed, wear a suitable dust mask, goggles and gloves. Avoid breathing vapours.

Treated seed is easily recognized by its prominent red colour. Label treated seed as follows: "This seed has been treated with Vitavax Solution Seed Protectant containing carbathiin. Do not use for food, feed or oil processing". Do not contaminate food or feed. Do not contaminate lakes, ponds or streams.

11. STORAGE: Store above 0°C. Do not store in or around the home.

12. DISPOSAL: Puncture and crush empty container, bury 50 cm deep away from any source of water, or take to designated disposal area.

•••••••LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE••••••

13. WHERE AVAILABLE: Alberta Seed Cleaning Association, Alberta Wheat Pool, Cargill Grain, Federated Co-op, Green Cross, Oliver Industrial Supply, Pioneer Grain, United Grain Growers.

Additional information available from:

Uniroyal Chemical Ltd.
#4, 1323 – 44 Avenue N.E.
Calgary, Alberta
T2E 6L5
Phone: (403) 276-9481

CARBATHIIN : THIRAM

1. FORMULATIONS: Dust – Vitavax Powder
   (carbathiin 26.7% : thiram 38.8%).

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES: With the insecticide, lindane (% carbathiin : % thiram : % lindane) – Vitavax Dual Powder (20.0 : 28.9 : 18.7); Vitavax rs Flowable (3.3 : 6.6 : 49.9); Vitavax rs Powder (3.3 : 6.7 : 50.0).

4. HOW IT WORKS: Thiram is a fungicide which controls seed-borne diseases. Carbathiin is a systemic fungicide which penetrates the seed coat to control diseases of the seed and seedling.

5. NUMBER OF APPLICATIONS: One, at the time of planting.

6. HOW TO APPLY:

With: Seed-dressing equipment.

Rate:

Crop	Disease	g/25 kg seed
Barley	Smuts (false loose, true loose, covered)	50
Flax	Damping-off, seed decay	60
Oats	Smuts (loose, covered)	70
Rye	Damping-off, seed decay, stem smut	45
Wheat	Smuts (loose, stinking), bunt	55

Protective Equipment: Wear a suitable dust mask, goggles, and rubber gloves.

7. APPLICATION TIPS: **Before using a new drum, stir.**
   Dust – **Do not mix with bare hands.** When starting with an empty drill or planter box, separately treat enough seed to cover the bottom of the box. Place this treated seed into the bottom of the empty drill or planter box to ensure that the first seed planted is adequately treated.

   Fill the drill or planter box to one-half capacity and sprinkle one-half the required amount of powder over the seed. Mix thoroughly with a stick or paddle until the seed is uniformly covered. Seed should all be pink. Then add enough seed to fill the box, cover with the remaining powder and repeat mixing procedure. For large drill or planter boxes, it may be necessary to divide the seed into several portions. Clean planter plates periodically to prevent excessive build-up of treatment chemicals.

6. GRAZING RESTRICTIONS: Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.

7. TOXICITY: Acute oral LD_{50} = 1600 mg/kg (rat)

8. SAFETY:

   Symptoms of poisoning: Skin contact may result in irritation and dermatitis. Consumption of alcohol within 24 hours of working with thiram may cause flushing, sweating, headache and nausea.

   Toxicological information (for the physician): There is no specific antidote. If swallowed, induce vomiting with syrup of ipecac or intubate the stomach. If reaction with alcohol occurs, treat as disulfiram-alcohol reaction.

   First aid: IF SWALLOWED – induce vomiting by giving syrup of ipecac (adult dosage 30 mL; children under 12 years 15 mL) followed by water to enhance vomiting. Keep patient quiet. Seek medical attention immediately. IF ON SKIN – wash with warm water and pumice soap to remove dye. IF IN EYES – flush immediately with running water. Seek medical attention.

11. PRECAUTIONS:

    KEEP OUT OF REACH OF CHILDREN. Work in a well ventilated area and wear a suitable dust mask, goggles and gloves. Do not get in eyes. Avoid contact with skin. Avoid consumption of alcohol 24 hours before or after working with product or treated seed. Do not contaminate food or feed. Do not contaminate any water supply.

12. STORAGE: Of product – do not store in or around the home. Do not store near food or feed. Store powder in a dry area. Do not store suspension in direct sunlight or at temperatures above 35°C. Suspension should not freeze even in extreme winter temperatures.

Of treated seed – do not store seed treated with powder. Treated seed must be labelled as follows: "This seed has been treated with Protectant containing carbathiin and thiram. Do not use for food, feed or oil processing." Do not store treated seed in or around the home.

10. WHERE AVAILABLE: Federated Co-op, Green Cross, Oliver Industrial Supply, Pioneer Grain, United Grain Growers.

Additional information available from:

Uniroyal Chemical Ltd.
#4, 1323 – 44 Avenue N.E.
Calgary, Alberta
T2E 6L5
Phone: (403) 276-9481

DUAL PURPOSE FORMULATIONS
CARBATHIIN : THIRAM : LINDANE

1. FORMULATIONS: (carbathiin : thiram : lindane)
   Suspension (SU) – Vitavax rs Flowable (3.3% : 6.6% : 49.9%)
   Dusts (D_1) – Vitavax rs Powder (3.3% : 6.7% : 50.0%)
   (D_2) – Vitavax Dual Powder (20.0% : 28.9% : 18.7%)
   Solution (SN) – Vitavax Dual Solution (carbathiin 16.9% : lindane 15.7%).

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Lindane is an organochlorine insecticide which acts by ingestion, contact and, to a lesser extent, by fumigant action against a wide range of soil-dwelling and phytophagous insects. Thiram is a fungicide which controls seed-borne diseases. Carbathiin is a systemic fungicide which penetrates the seed coat to control diseases of the seed and seedling.

4. NUMBER OF APPLICATIONS: One, at the time of planting.

5. HOW TO APPLY:

With: Seed-dressing equipment.

Rate:

Crop	Diseases and Insects	g(D)	mL(S_)/25 kg seed
Barley	Smuts (covered, false loose, true loose), wireworms	70(D_2)	75(SN)
Canola	Damping-off, seed decay, blackleg, flea beetles	750(D_1)	562(SU)
Flax, Mustard,	Damping-off, seed decay, blackleg, flea beetles	70(D_2) 750(D_1)	
Oats	Smuts (covered, loose), wireworms	95(D_2)	105(SN)
Rye	Stem smut, damping-off, seed decay, wireworms	60(D_2)	
Wheat	Smuts (loose, stinking), bunt, wireworms	65(D_2)	75(SN)

Protective Equipment: Wear a suitable dust mask, goggles and rubber gloves.

6. APPLICATION TIPS: Flowable can be applied either in a continuous treating operation with S-Series Treaters or OFT Treaters (available from Uniroyal Chemical) or with batch treaters or cement mixers.

   Powder can be applied to seed when the drill or planter box is filled. When starting with an empty drill or planter box, separately treat enough seed to cover bottom of box. Place this treated seed into bottom of empty drill or planter box to ensure that first seed planted is adequately treated.

   Fill drill or planter box to one-half capacity and sprinkle half the amount of powder required for the full box over seed. Mix thoroughly with a stick or paddle until seed is a uniform white. Add enough seed to fill the box, cover with remaining powder and repeat mixing procedure. For large drill or planter boxes, it may be necessary to divide the seed into several portions. Clean planter plates periodically to prevent excessive build-up of treatment chemicals. **Do not mix with bare hands.**

   Solution can be applied on the farm by using an auger with special equipment or an inexpensive pump or dripolator device. May be applied also at seed cleaning plants or other outlets using specially designed, high capacity equipment.

7. GRAZING RESTRICTIONS: Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.

8. TOXICITY: Acute oral LD_{50} (rat): Vitavax rs (421), Vitavax Dual Solution (1740), carbathiin (3820), thiram (375), lindane (88).

9. SAFETY:

   Symptoms of poisoning: With lindane – nausea, vomiting, hyper-irritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis. Consumption of alcohol 24 hours before or after working with thiram may cause sweating, flushing, headache and nausea.

Toxicological information (for the physician): Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline. Carbathiin and thiram have no specific antidote. If swallowed – induce vomiting with syrup of ipecac or intubate the stomach. If reaction with alcohol occurs, treat as disulfiram-alcohol reaction.

First aid: IF SWALLOWED – induce vomiting by giving syrup of ipecac (adult doses 30 mL; children under 12 years 15 mL) followed by water to enhance vomiting. Keep patient quiet. Seek medical attention immediately. IF ON SKIN – wash with warm water and soap. IF IN EYES – flush immediately with running water. Seek medical attention.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Work in a well ventilated area and wear a suitable dust mask, goggles and gloves. Do not get in eyes. Avoid contact with skin. Avoid consumption of alcohol 24 hours before and after working with product or treated seed. Do not contaminate food or feed. Do not contaminate any water supply.

11. STORAGE: Do not store in or around the home. Do not store near food or feed. Vitavax rs Flowable and Dual Solution may freeze – store above 0°C. Seed treated with flowable may be stored for up to 3 months. Do not store in areas where temperatures exceed 25°C or in direct sunlight and label: "This seed has been treated with Dual Purpose Seed Protectant – contains fungicides carbathiin and thiram and insecticide lindane. Do not use for food, feed, or oil processing." Store powder in dry area. Do not store seed treated with powder. Leftover seed treated with powder should be double sown around the headland, or buried away from water sources.

12. WHERE AVAILABLE: Alberta Seed Cleaning Association, Alberta Wheat Pool, Cargill Grain, Federated Co-op, Green Cross, Oliver Industrial Supply, Pioneer Grain, United Grain Growers.

Additional information available from:

Uniroyal Chemical
#4, 1323 – 44 Avenue N.E.
Calgary, Alberta
T2E 6L5
Phone: (403) 276-9481

FORMALDEHYDE (formalin)

1. FORMULATIONS: Solution – 37% formaldehyde (formalin)

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Formaldehyde is a powerful bactericide and fungicide, used as a soil fumigant and seed treatment, although the latter use is limited by phytotoxicity.

4. NUMBER OF APPLICATIONS: One.

5. HOW TO APPLY:

With: Small sprayers or sprinklers.

Rate: Crop	Diseases	g/25 kg grain
Barley	Covered smut	40
Oats	Smuts: covered, loose	40
Wheat	Bunt and covered smut	40
Potato tubers	Common scab, black scurf, rhizoctonia	50 mL (cold) or 100 mL (hot)

Water Volume: Potato tubers – cold treatment – use 50 mL/10 L water to soak uncut tubers for 2 hours; hot treatment – use 100 mL/10 L 49-52°C water to soak uncut tubers for 3-4 minutes, then cover for one hour. Allow tubers to dry before cutting and planting. Grain – use 325 g/100 L water.

Protective Equipment: Wear a gas mask and rubber gloves.

6. APPLICATION TIPS: Grain – pile grain on a clean floor, sprinkle well with solution and shovel over until all grains are thoroughly wet. Cover for 4 hours (or overnight) with clean sacks or blankets moistened with solution. Sow as soon as possible, preferably while still damp. If smut balls are present, immerse grain in the solution for 5 minutes. Stir. Skim off smut balls. Drain thoroughly and cover as above.

7. TOXICITY: Acute oral LD_{50} = 800 mg/kg (rat)

8. SAFETY:

Symptoms of poisoning: Skin contact may produce irritation and dermatitis. Ingestion may cause severe abdominal pain, nausea, and vomiting, sometimes followed by stupor. Exposure to vapours may cause burning and stinging of eyes and headache.

First aid: IF SWALLOWED – induce vomiting by touching back of the throat with a finger or blunt object; repeat until vomit fluid is clear. Then give a gruel of flour and water. **Do not induce vomiting or give anything by mouth to an unconscious person.** Rush patient to nearest hospital taking the labelled container with you. IF ON SKIN – remove contaminated clothing and wash skin with soap and water. IF IN EYES – flush with plenty of water for 15 minutes and get medical attention. IF INHALED – remove patient to fresh air; have him lie down and keep quiet and warm. Give patient egg white and milk; obtain medical attention.

9. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. A gas mask should be worn to prevent inhaling the gas fumes, and gloves to prevent skin irritation. Leave the room or building as soon as possible. Avoid prolonged or repeated contact and breathing of vapor. May cause irritation of skin, eyes, nose, and throat. Use with adequate ventilation. Keep away from heat, fire and sparks. Do not contaminate food, feed, or any body of water.

10. STORAGE AND DISPOSAL: Do not freeze. Minimum storage temperature 15°C. Store in a cool, dry, ventilated place, away from food and feed. Puncture empty container and bury at least 50 cm deep and away from water supply.

11. WHERE AVAILABLE: Westcan Horticultural Specialists Ltd.

Additional information available from:

Later's Chemicals Ltd.
2239 – 14 A Street S.E.
Calgary, Alberta
T2G 3L1
Phone: (403) 265-3501

DUAL PURPOSE FORMULATIONS
MANEB : LINDANE

1. FORMULATIONS: Dusts – Co-op DP, Mergamma N-M, Pool N-M Dual and Trinox (37.5% : 18.75%)

2. MARKETING CATEGORY: Commercial

3. HOW IT WORKS: Maneb is a protective, seed-treatment fungicide.
   Lindane is an organochlorine insecticide that works by ingestion, contact and, to a lesser extent, by fumigant action against a wide variety of soil-dwelling and phytophagous insects.

4. HOW TO APPLY:

With: Seed-dressing equipment.

Rate:	**Crop**	**Diseases and Insects**	**g/25 kg seed**
	Barley	Smuts (covered, false loose), seedling blight, root rot, wireworms	65
	Oats	Smuts, seedling blight, root rot, wireworms	92
	Rye	Bunt, seedling blight, root rot, wireworms	56
	Wheat seedling blight, root rot, wireworms	Bunt, stinking smut,	52

Protective Equipment: Wear a dust mask, goggles, long-sleeved shirt and an apron and gloves made of rubber or PVC when handling this product. Ventilate indoor work areas.

5. SPRAYING TIPS: Treat enough seed to cover bottom of drill box by mixing with the proper amount of product in a suitable container which can later be destroyed. Spread this treated seed over bottom of drill box before adding any untreated seed.

   Place and level one-half of seed in drill box and sprinkle one-half of required amount of product uniformly over seed. Mix thoroughly with a stick or paddle **(do not mix with hands).** Fill box with seed and sprinkle remaining one-half of powder on the surface and mix again until all streaking has disappeared and colouring of seed is uniform.

   Alternate Methods:
   - i) Dribble the required amount of product into the seed as it is poured into the drill box. Thoroughly mix with a stick or paddle when drill box is one-half full and again when full until colouring of seed is uniform.
   - ii) Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.
   - iii) Apply with any standard dry seed-treatment application equipment.

6. TOXICITY: Acute oral LD_{50} (rat): maneb (6750), lindane (88).

7. SAFETY:

   Symptoms of poisoning: Lindane – may include nausea, vomiting, hyper-irritability, convulsions, coma, and other symptoms typical of organochlorine insecticide poisoning. Skin contact with maneb may produce irritation or dermatitis.

   Toxicological information (for the physician): Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline.

   First aid: IF SWALLOWED – cause vomiting by sticking finger down throat or swallowing syrup of ipecac, then give a laxative such as epsom salts. Avoid liquid petrolatum and castor oil. Get medical attention. IF IN EYES – flush with plenty of water. IF ON SKIN – wash with soap and water.

8. PRECAUTIONS:

   KEEP OUT OF REACH OF CHILDREN. Poisonous if swallowed, inhaled or absorbed through the skin. Do not contaminate food, feed or any water supply. Treat only the amount of seed required to avoid having to store treated seed. If treated seed must be stored, label as follows: "Poisonous to man and animals. This seed has been treated with maneb fungicide and lindane insecticide for the control of diseases and insects. Do not use as food or feed."

9. STORAGE: Store in a dry place. Do not store in or around the home. Do not store near food or feed. Never allow product to become wet during storage. This may lead to chemical changes which will reduce the effectiveness of fungicide. Keep container closed when not in use. Do not store treated seed more than one year.

10. WHERE AVAILABLE: Co-op Farm Supply Centres.

Additional information available from:

Federated Co-operatives Ltd.
Box 1050
Saskatoon, Saskatchewan
S7K 3M9
Phone: (306) 244-3208

MANZATE-D, DITHANE M-22 (maneb)

1. FORMULATIONS: Drill Box Seed Treatments – Agrox N-M Wettable Powder, Co-op N-M Dust, Pool N-M Dust (50% maneb). Foliar Spray – Maneb 80-W Wettable Powder (80% maneb).

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES: With lindane as dual purpose formulations. Compatible with most insecticides and fungicides but not with Bordeaux or lime.

4. HOW IT WORKS: Maneb is a fungicide, effective against many seedling and foliar diseases.

5. NUMBER OF APPLICATIONS: One for seed treatment. Repeat every 7-10 days for treatment of early and late blight on potatoes; shorten interval to 5-7 days when weather favours disease. Repeat at 7-10 day intervals on sugar beets.

6. HOW TO APPLY:

(a) How To Apply Seed Treatments

With: Drill box applicator

Rate:

Crop	**Disease**	**g/25 kg seed**
Barley	Smuts covered, false loose	50-66
Flax	Seedling blight, damping-off	112
Oats	Smuts	69-92
Rye	Bunt	28-43
Wheat	Bunt or stinking smut	26-40

(b) How To Apply Foliar Spray (80W)

With: Ground equipment

Rate:

Crop	**Disease**	**g/ac**	**(kg/ha)**
Potato(1)	Early blight, late blight	911	**(2.25)**
Sugar beet(14)	Cercospora leaf spot	911	**(2.25)**

Note – **Pre-harvest interval** (days) given in brackets following crop.

Protective Equipment: Wear a dust mask, goggles, long-sleeved shirt, rubber or PVC gloves and rubber or PVC apron when handling product. Ventilate indoor working area.

7. APPLICATION TIPS:

Drill Box Seed Treatment – Treat enough seed to cover bottom of drill box by mixing with proper amount of product in a suitable container which can later be destroyed. Spread this treated seed over bottom of the drill box before adding any untreated seed.

OR

Place and level one-half of the seed in drill box and sprinkle one-half of the required amount of product uniformly over seed. Mix thoroughly with a stick or paddle **(do not mix with hands)**. Fill box with seed and sprinkle remaining one-half of powder on the surface and mix again until all streaking has disappeared and colouring of seed is uniform.

OR

Dribble the required amount of product into seed as it is poured into drill box. Thoroughly mix with a stick or paddle when drill box is one-half full and again when full until colouring of seed is uniform.

OR

Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.

OR

Apply with any standard dry seed-treatment application equipment.

Potatoes – early blight – start spraying when plants are 15 cm high; late blight – start in mid-July or when disease is reported in the area.

Sugar beets – apply when disease first noticed.

8. TOXICITY: Acute oral LD$_{50}$ = 6750 mg/kg (rat)

*********LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE********

9. SAFETY:

First aid: IF SWALLOWED – induce vomiting by touching the back of the tongue with a blunt object; repeat until vomit is clear. Take patient to nearest hospital taking the labelled container with you. IF ON SKIN – remove contaminated clothing and wash with soap and water. IF IN EYES – flush with plenty of water for 15 minutes and get medical attention.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Hazardous if swallowed or inhaled. May cause irritation of eyes, nose, throat and skin. Avoid inhalation of dust or spray mist. After handling and before eating, drinking or smoking, wash thoroughly with soap and water and change to clean clothing. Do not apply or allow to drift to areas occupied by unprotected persons or to streams, lakes or ponds to protect wildlife. Avoid contamination of feed or food, including such crops on which residue is unsafe.

11. STORAGE: Store product in a cool, dry place away from food or feed. Prevent the contents from becoming wet as this will reduce effectiveness and may cause flammable vapours. Keep away from fire and sparks. Burn empty bag; stay out of smoke.

12. WHERE AVAILABLE: Co-op Farm Supply Centres.

Additional information available from:

Federated Co-operatives Ltd.
Box 1050
Saskatoon, Saskatchewan
S7K 3M9
Phone: (306) 244-3208

MERTECT (thiabendazole)

1. FORMULATIONS: Suspension – Flowable (40% thiabendazole)

2. MARKETING CATEGORY: Commercial.

3. HOW IT WORKS: Thiabendazole is a fungicide which controls *Fusarium, Helminthosporium, Oospora, Phoma* and *Rhizoctonia* fungi.

4. NUMBER OF APPLICATIONS: One per season.

5. HOW TO APPLY:

With:	Spray equipment.		
Rates:	**Crop**	**Disease**	**mL/1000 kg potatoes**
	Potatoes	Storage rot.	90
Water Volume:	8 L product/170 L water. Spray 2 litres of this suspension per metric tonne of potatoes.		

6. APPLICATION TIPS: Potatoes must rotate along the conveyor line to ensure complete coverage.

7. TOXICITY: Acute oral LD_{50} is 3,300 mg/kg (rat).

8. SAFETY:

   Symptoms of poisoning: may cause skin irritation.

   Toxicological information: product contains petroleum distillates.

   First aid: IF SWALLOWED – do NOT induce vomiting. Contact a physician. IF IN EYES – flush with plenty of water for 15 minutes. Contact a physician. IF ON SKIN – wash thoroughly with soap and water.

9. PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN. Harmful if swallowed.
   Avoid contact with skin, eyes or clothing. Wash hands, face and arms after use and before eating, drinking or smoking. Consult with manufacturer before mixing with other chemicals.

10. DISPOSAL: Do not remove container – destroy when empty. When cleaning equipment or disposing of wastes, do not contaminate any water sources.

11. WHERE AVAILABLE: Chipman dealers.

    Additional information available from:

    MSD Agvet
    Division of Merck Frosst Canada Inc.
    P.O. Box 1005
    Pointe Claire Dorval, Quebec
    H9R 4P8

TERSAN, THIRAM 75 (thiram)

1. FORMULATIONS: Wettable Powders (WP) – (75% thiram)
   Suspension (SU) – Flowable (32.4% thiram)

2. MARKETING CATEGORY: Commercial

3. REGISTERED MIXES: In various combinations with other fungicides (benomyl, carbathiin and phenylmercuric acetate) and, as dual purpose formulations, with insecticides (chlorfenvinphos, ethion, fensulfothion, fonophos and lindane).

4. HOW IT WORKS: Thiram is a protective fungicide which is applied as either a foliar spray or a seed-treatment powder.

5. NUMBER OF APPLICATIONS: Seed treatments – one.

6. HOW TO APPLY:

With: With seed-treatment equipment.

Rates:

Crop	Disease	Qty/25 kg seed
Alfalfa	Verticillium wilt	90 g WP or 180 mL SU
Canola, mustard, sugar beet	Seed decay, seedling blight, damping-off	100 g WP
Bean (snap dry), pea soybean	Seed decay, seedling blight, damping-off	25-35 g WP
Corn (sweet)	Seed decay, seedling blight, damping-off	55 g WP

Protective Equipment: Wear goggles, gloves and a suitable dust mask.

7. APPLICATION TIPS: Oilseeds – mix thiram powder and seed in drill box. Simultaneous treatment with an insecticide for control of flea beetles is recommended (see also the manual sections on carbofuran and lindane).

8. TOXICITY: Acute oral LD_{50} is 375-865 mg/kg (rat).

9. SAFETY:

Symptoms of poisoning: May irritate eyes, nose, throat or skin. May cause allergenic eczema in sensitive individuals.

First aid: IF IN EYES – immediately flush with plenty of water. Get medical attention. IF ON SKIN – wash with warm water and soap for 15 minutes.

10. PRECAUTIONS:

KEEP OUT OF REACH OF CHILDREN. Avoid breathing dust or spray mist. When treating, augering or handling treated seed, work in a well-ventilated area and wear goggles, gloves and a suitable dust mask. Wash thoroughly after handling and before eating, drinking or smoking. Wash contaminated clothing with soap and hot water before wearing. Avoid alcoholic beverages 24 hours before and after working with thiram or thiram-treated seed because of unpleasant side-effects that may be incurred.

11. STORAGE: Store in a cool, dry, ventilated place away from food or feed. Keep away from heat, fire or sparks. Label treated seed as: "Do not use for food or feed. This seed has been treated with the fungicide, Thiram".

12. WHERE AVAILABLE: Alberta Wheat Pool, Ag. Turf, King Agri-Service, Oliver Industrial Supply.

Additional information available from:

Uniroyal Chemical
#4, 1323 – 44 Avenue N.E.
Calgary, Alberta
T2E 6L5
Phone: (403) 276-9481

MAPS NOT

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